FEBRUARY, 1931

7TH TIER

25 Cents, $1 a Yea

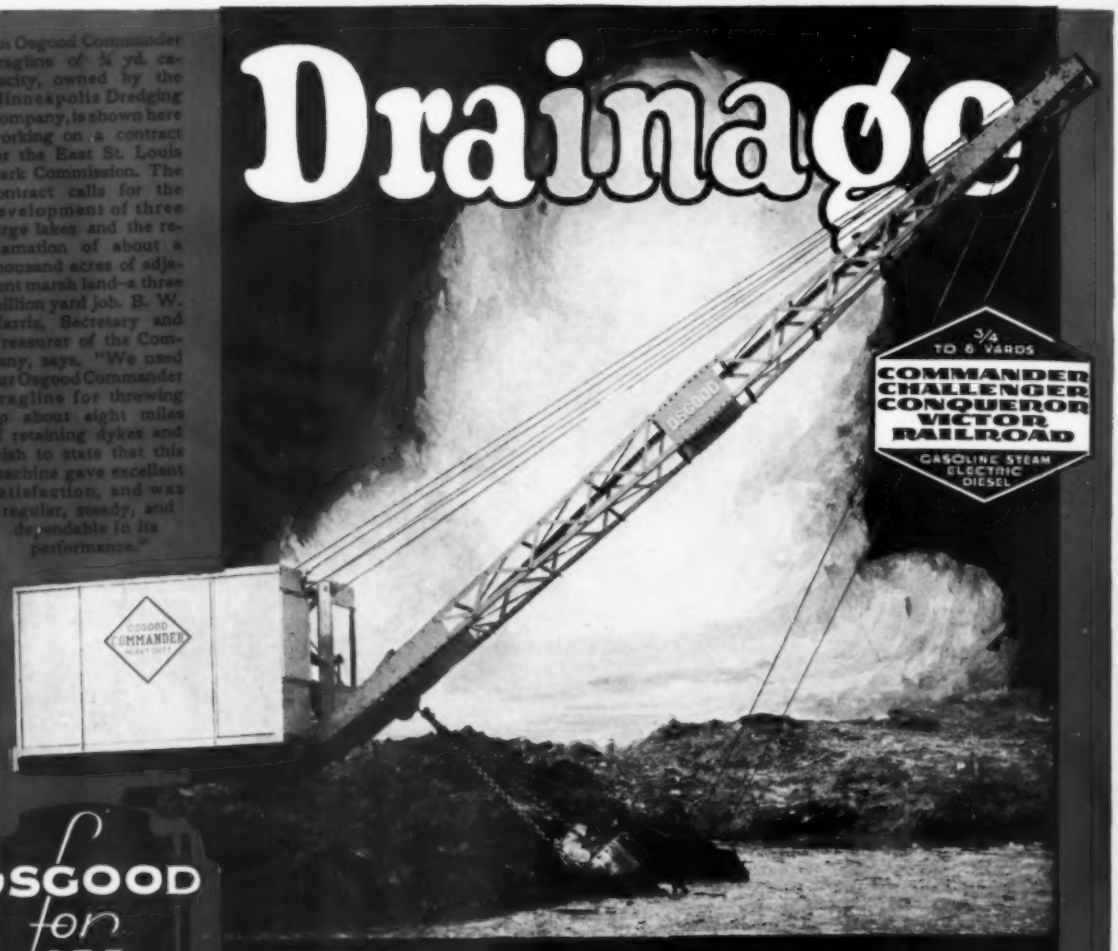
Contractors and Engineers Monthly

Including
The
Consulting
Engineer

A Roadside Quarry in West Virginia
See page 7

Drainage

An Osgood Commander dragline of ¾ yd. capacity, owned by the Minneapolis Dredging Company, is shown here working on a contract for the East St. Louis Park Commission. The contract calls for the development of three large lakes and the reclamation of about a thousand acres of adjacent marsh land—a three million yard job. B. W. Harris, Secretary and Treasurer of the Company, says, "We used our Osgood Commander dragline for throwing up about eight miles of retaining dykes and wish to state that this machine gave excellent satisfaction, and was regular, steady, and dependable in its performance."



¾ TO 6 YARDS
COMMANDER
CHALLENGER
CONQUEROR
VICTOR
RAILROAD
GASOLINE STEAM ELECTRIC DIESEL

OSGOOD for ALL JOBS

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QUARRIES
MATERIAL YARDS
AND MANY MORE

TIRELESS WORKERS

There are a lot of big jobs packed into an Osgood—the kind of jobs that require fast, powerful digging. Drainage, for instance—here's a job that calls for a tireless worker—a digger that will dive right into the work, come up with a pay load each time, and have plenty of energy to follow the job through to a profitable completion. It is this kind of service—a steady piling up of yardage with super strength for the big jobs that has built Osgood's reputation. To know Osgood's capacity, put it to the test on the next drainage job. Every pass of the dipper will yield a handsome reward.

THE OSGOOD CO.
MARION OHIO

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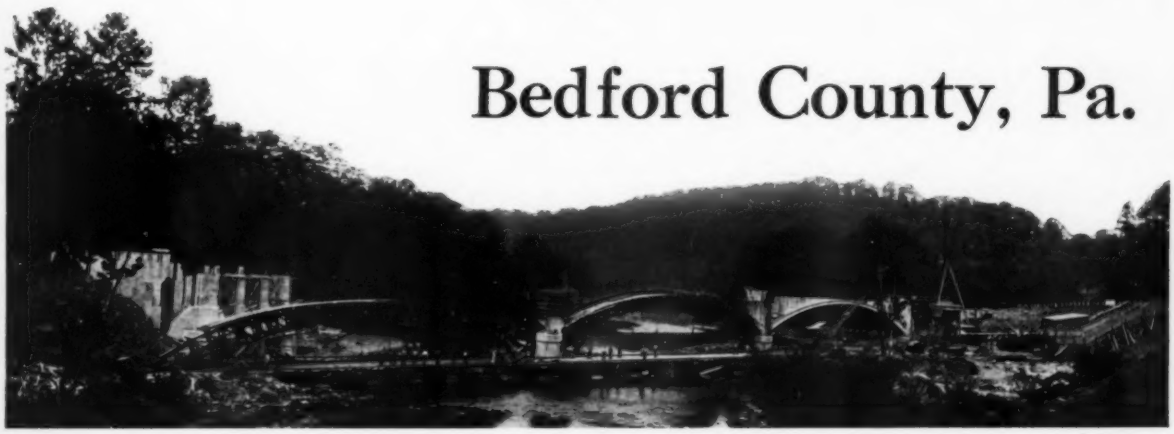
A Heavy Rock Cut *and* Concrete Arch Bridge *in* Bedford County, Pa.



By
C. R. Forbes
Division Engineer
Pennsylvania Department of Highways

ON March 17, 1930, the Pennsylvania Department of Highways awarded to Thomas Sheahan of Hagerstown, Maryland, a contract for the construction of a bridge on State Highway Route 39, Bedford County, at a point known as Juniata Crossings, over the Juniata River, to replace the existing two-span wooden truss covered bridge that had originally been built in 1818. One of the spans of this wooden truss covered bridge was washed away about 1889, and replaced by the Commissioners of Bedford County, while the other span is the one that was built originally. The total length of the project that was placed under contract is 4,048 feet, of which length 493 feet is occupied by the new bridge, and the balance by the road approaches.

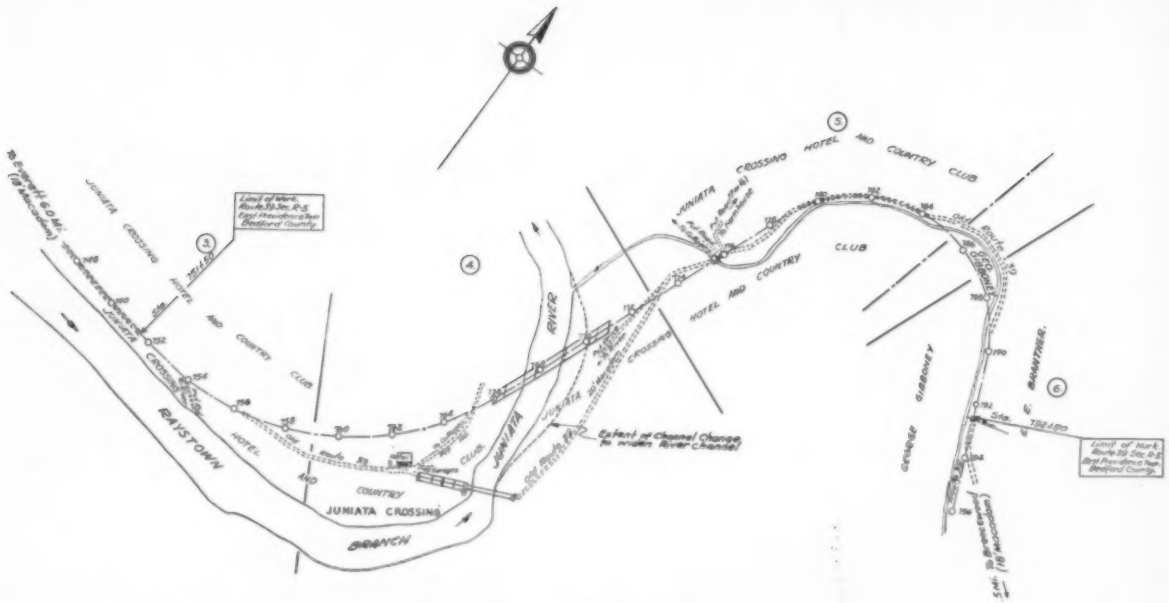
The location of the new bridge is about 400 feet downstream, or north of the old bridge and was placed over the Juniata River on a 45-degree angle. This was deemed advisable in order to eliminate the dangerous conditions that existed on the alignment of the old location of this highway.

In order to provide these approaches to the bridge at this new location and insure safety to the traveling public, it was necessary to remove about 50,000 cubic yards of excavation, of which excavation 70 per cent could be classified as solid rock.

Design of Bridge

The bridge was designed by E. E. Brandow, Engineer of Bridges for the Pennsylvania Department of Highways, the design being a reinforced concrete ribbed arch bridge, consisting of three spans, each 129 feet in the clear measured on the center line of the roadway, as well as six arch approach spans, three at each end, each being 10 feet 6 inches in the clear measured on the center line of the roadway, with an overall length of about 493 feet, the main spans having a clear height of 34 feet, with a clear roadway of 40 feet measured between curbs, at a skew of 45 degrees.

Typical Rock Excavation at the East Approach to the Bridge



Map Showing Relocation of the Highway in Comparison with the Old Road. New Location Shown as a Dot and Dash Line, with Station Numbers Marked. Old Road Designated by a Double Dotted Line

QUANTITIES

The quantities involved for the bridge construction alone are:

3,700 cubic yards of excavation for the bridge proper
6,000 cubic yards of excavation to widen the channel of the river
2,190 cubic yards of Class A concrete
3,814 cubic yards of Class B concrete
767,900 pounds of plain steel bars
2,311 pounds of fabricated structural steel
1,622 square yards of bridge floor pavement
341 pounds of 14-ounce copper flashing
80 bronze bearing plates

Two classes of concrete were used in this construction, namely: Class A and Class B—Class A concrete being composed of one part portland cement and six parts of fine and coarse aggregate, proportioned as a 1:2:4 mix, and the Class B concrete being composed of one part portland cement and seven and one-half parts of fine and coarse aggregate, proportioned on a 1:2½:5 mix, crushed stone being used as a coarse aggregate.

The abutments and piers from the bottom of the foundation to the top of the pier or springing line, or skew backs, were built of Class B concrete, and these abutments and piers were reinforced not only on the faces, but also on the bottom of the foundation, being spaced 6 inches from all faces. All concrete placed above the springing line, or skew backs, was Class A.

EXCAVATION

The contractor started work on April 14, 1930, with a small force of labor, excavating by hand the west abutment and the first pier therefrom. On April 16, two power shovels and one crane were placed on the work. The excavation for the west abutment and first pier was through solid rock and hard shale. On April 15, the plant for the handling of materials was started.

A temporary bridge across the river, started on April 22 and completed on April 27, parallelled the structure to be built. This temporary bridge was used for transporting materials and the placing of the concrete in the structure from the traveling tower.

FOUNDATIONS

The completion of the excavation for the foundation of all the piers was on June 19, and the excavation for this last pier was the only one in which the foundation was in the river. No difficulties were experienced with the water in the excavation for this foundation due to the extreme low water at this time, and no sheet piling was necessary, it being possible to keep the water out of the foundation by an earth dam protected by sand bags.

All of the foundations in connection with this structure were on solid rock and, before the structure was designed, soundings had been made to determine the depth that solid rock would be encountered, and upon construction, there was no foundation that had to go to a lower elevation than that which the soundings taken had shown. Form work was provided for the concrete foundations in all parts of this structure.

The aggregates for the concrete were handled from a stockpile to a batching plant by the use of a crane with a clamshell, and the batcher was equipped with scales.

The cement house was located close to the batcher and the cement wheeled out as used and dumped into a chute which ran directly into a truck under this batcher.

All aggregates that entered into the concrete were handled by batches and all of these batches were proportioned by weight.

HANDLING THE CONCRETE

A 21-E concrete mixer was used to mix the concrete and discharged directly into the bucket on the tower

which was elevated to a hopper to which chutes were attached, and these chutes were lowered so that at no time was the concrete permitted to drop more than 4 feet.

The tower consisted of a single steel mast, mounted on one corner of a timber frame, which was fitted with wheels and moved back and forth on rails which were laid on the temporary bridge.

Directly opposite the mast, the hoisting engine was located and helped to counterbalance any overturning effect of the chutes. The mast was also braced with heavy timber to each corner of the frame and securely guyed.

Two small trucks were used to handle the material from the batcher to the concrete mixer.

MATERIAL TESTING

The Department of Highways supervised the weighing of materials and two inspectors were assigned to the material plant, one to inspect materials and the other to supervise the weight proportioning, and the plant inspector in charge of testing materials, when not at this work, was used on other work in connection with the construction.

All materials entering into this work were tested and approved by the Engineer of Tests of the Pennsylvania Department of Highways in the laboratory at Harrisburg, Penna.

The weighing hopper was approved by the Department prior to being used on this contract and the checking of hoppers and scales was done in the following manner:

Readings on the beam or dial of the scale had to agree when tested with check weights within 0.4 of 1 per cent. The equipment was platform-operated and the operation of the gates was so arranged that the beam or dial was in full view of the operator.

This scale equipment for weighing these aggregates had to be capable of weighing to increments of 5 pounds,

Northwest Crane and Clamshell Handling Aggregate for the Blaw-Knox Batcherplant

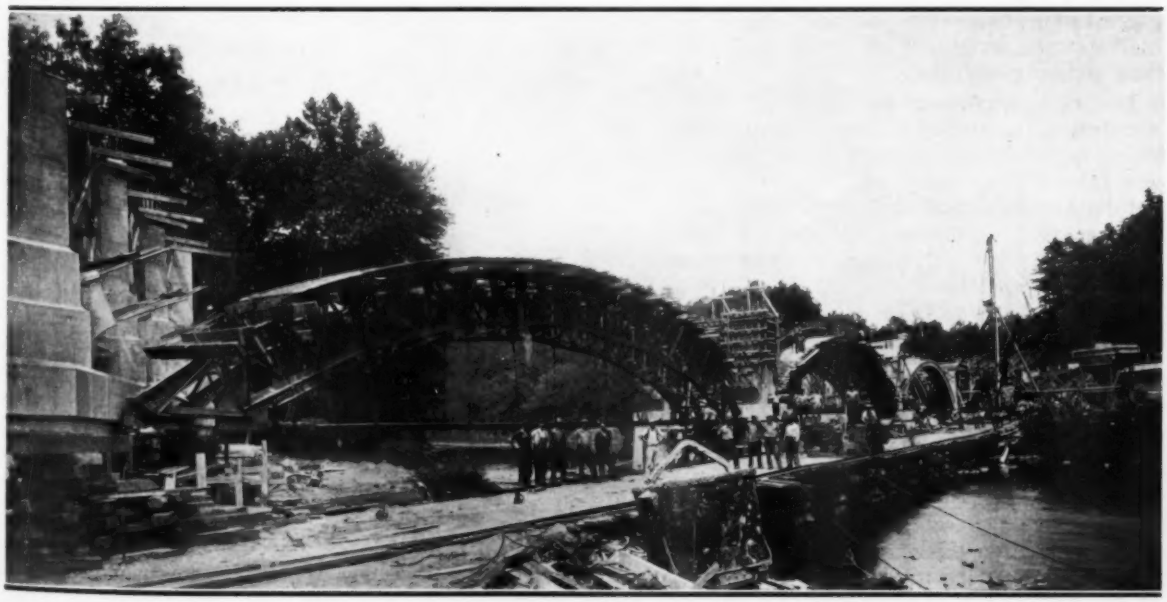
and was equipped with an instrument to register when the correct quantities had been placed in the hopper. Also, provision was made in the hoppers for the convenient removal of excess material in case of overloading so that the beam was brought to balance for each batch.

The poises were so constructed that they could not be easily detached and were designed so that once seated they secured equilibrium and held firmly in place without any movement.

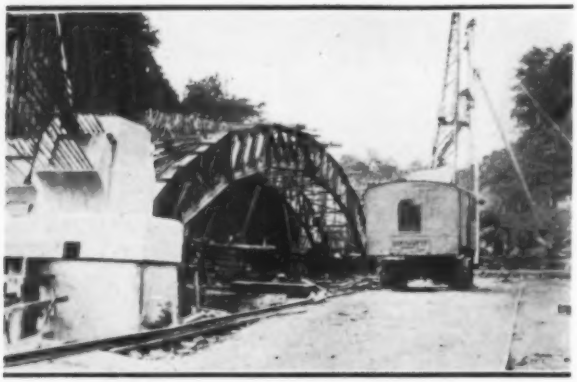
The normal position of the beams of the scales was horizontal and had equal play above and below the horizontal position.

Counter weights that were used in assisting to close the gates were attached to and made a part of the weighing hoppers without any connection to any other part of the batcher, so that there would be no variance in the results.

The scale itself was checked for balance from five



Blaw-Knox Steel Centers for the Ribs of the Arches on the Juniata Crossings Bridge



The Crane and Traveling Tower on the Temporary Bridge and the Steel Centers in Place on Span H

to ten times a day and was checked with weight checks once a day and a batch of material was check-weighted on a platform scale that had been tested.

The engineer in charge of the work had the actual weights of both fine and coarse aggregates posted so that the inspector at the plant would have them in full view at all times and these weights were based on classification of materials and the size of the batch that was used.

In determining the weight, each bag of cement weighing 94 pounds was considered as 1 cubic foot, and the weight of the fine aggregate was considered to be 103 pounds per cubic foot, which compensated for a theoretical moisture content of 3 per cent.

AGGREGATES

The coarse aggregate used on this work was crushed stone, and divided into three classes, which classifications of rock were based on the average specific gravities of different crushed stone that was available; No. 1 crushed stone to weigh 90 pounds per cubic foot; No. 2 crushed stone, 95 pounds per cubic foot; and No. 3 crushed stone, 100 pounds per cubic foot. These classifications were designated by the Engineer of Tests in the Harrisburg laboratory.

The fine aggregate used was a sand that was a product representing the natural disintegration of rock and consisting of clean, hard, durable grains, free from lumps of clay and all vegetable and deleterious matter, and did not contain more than 3 per cent by weight of silt or other foreign substances. It was uniformly graded from coarse to fine, with the coarse parts predominating, and when tested by the laboratory sieves, met the following requirements:

	Min.	Max.
Passing ¼-inch circular screen	100	
Passing No. 4 sieve	85	100
Passing No. 20 sieve	35	65*–80*
Passing No. 50 sieve	5	30
Passing No. 100 sieve	0	6

* The Department reserved the right to limit the amount passing the No. 20 sieve within the range specified, in order to obtain the required strength.

The coarse aggregate or crushed stone in this case that was used on this work was obtained from clean, tough, durable rock, free from a slatey texture or cleavage planes with a percentum of wear of not more than 5 and a toughness of not less than 6, and was subjected to a soundness test. It was tested by laboratory screens and met the following requirements:

	Total Percentum That Had to Pass Screens of the Following Openings:					
Coarse aggregate for:	⅜-inch	¾-inch	1¼-inch	1½-inch	2½-inch	2¾-inch
Class A concrete	0–8	10–40	95–100	100		
Class B concrete	0–8	5–20	30– 65		95–100	100

The abutments and piers carrying the ribs of the arches, up to the top of the piers or the springing line, were built in four sections.

The contractor was required to file a certified copy of his portland cement contract with the Engineer of Tests, Department of Highways, Harrisburg, Penna., at least two weeks prior to the date of starting any portland cement shipments, and this information covered:

1. Manufacturer of portland cement.
2. Brand name of portland cement.
3. Quantity ordered (barrels).
4. How shipments were to be distributed; if contract, so stated.
5. Shipping instructions as to destination.

The contractor also was required to furnish the Division Engineer a copy of the shipment notice showing the quantity in each shipment of portland cement received, and in addition, furnished a daily statement giving the following information:

1. Quantity of portland cement received previously.
2. Quantity of portland cement on contract in storage, exclusive of that on attached shipment notice.
3. Quantity of portland cement received as per attached shipment notice.
4. Quantity of portland cement used on contract, itemized separately.

These same requirements were required from the contractor as to contract and inventories of sand and stone.

The steel reinforcement that was used on this work was made from new billets by the open hearth process, and of the grade known as structural steel. They had to be free from dirt, oil, paint, grease, mill-scale, and loose or thick rust, and when the length of these reinforcing bars required splicing they were lapped 50 diameters.

FORM WORK

The form work that was used on the abutments and piers was 2-inch lumber, dressed on both sides, of a uniform width not exceeding 10 inches, sound and free from loose knots, and these were secured to studs or uprights in horizontal lines, with the walers properly spaced and the whole form held together by the use of long bolts, which bolts were removed immediately after the forms were removed.

The form work that was used in the superstructure, such as ribs for the arches, brackets, parapets, etc., were ⅞-inch tongued and grooved, surfaced on one side and properly held in place by the necessary uprights and walers.

The centering used for the ribs of the arches were steel centers—and four of these sets were used to complete the three spans.

Before any concrete was placed in the forms, it was required that they be drenched with water on both faces immediately before the concrete was placed therein, and for the parapets and exposed surfaces of the girders, ribs, coping, etc., the forms were treated with an

approved oil, which prevented the concrete from adhering.

The curing of the parapets, floors, and finished surfaces was given special attention to see that they were protected from the sun, and the whole structure was kept wet for a period of seven days by the use of three thicknesses of burlap.

The time of removing the horizontal forms carrying the load, or the striking of centers and the permitting of loads on the concrete structure was determined by the strength of the concrete as indicated by the modulus of rupture test. This time was to be not less than double the time in days required by the concrete used in the structure to obtain a strength in modulus of rupture of not less than 500 pounds per square inch, and was effective after the pouring of the last concrete in that portion of the structure which carried the load. Forms on vertical surfaces which did not sustain loads were removed from 24 to 48 hours after the placing of the concrete.

QUANTITY OF EQUIPMENT USED

The equipment used in the excavation for the roadway was:

Two power shovels—one with a dipper having a capacity of ¾-cubic yard, and the other with a capacity of 1¼ cubic yards.
Two Caterpillar Thirty bulldozers—used to level off the fills.
Two 10-ton rollers, for the compaction of the embankments.
Two well drilling outfits, working continually. The largest shot put off was loaded with 1,400 pounds of dynamite.
An average of seven trucks, sufficient to keep both shovels at work.

ROADWAY GRADING

This project is located on what is known as the Lincoln Highway, carrying heavy traffic, and at all times this traffic was maintained with little delay as the work progressed.

The grading for the roadway was 40 feet in width, and the surface, when completed, will be 20 feet in width, with shoulders 10 feet wide on each side. The bridge has a total width, from out to out of parapets, of 43 feet 6 inches, and a roadway width of 40 feet.

The price bid for the completion of this entire project was $271,546.37, and all of this work was completed and performed to the satisfaction and approval of the Chief Engineer within the 160 working days allowed in the contract.

A Power Shovel Working at Elevation 14,000 *Feet on the Harding Memorial Highway*

Building the World's Highest Road

THE Harding Memorial Highway or Mount Evans Road, leading from Denver to the top of Mount Evans, one of the highest Colorado peaks, has been under construction for several years. Each year a new section of road is completed, pushing the highway to an eventual altitude of 14,106 feet. It is expected that the road will be completed during the 1931 construction season.

One of the troubles which have been encountered by the contractor has been the difficulty in finding employees who could work in the rarified air conditions existing at this altitude. During the months of July and August daily snow falls seriously handicapped the operations of the contractor. Workmen suffered from the cold, although their base camp was built at an altitude of 12,000 feet and about 4 miles from the top of the peak.

Alcohol was used in the radiator of the General Excavator which W. W. Giggey & Co., contractor of Boulder, Colo., used for most of the grading on this job. The engine used on the excavator was a standard Buda rated at 55 horsepower at 1,450 rpm.

Another element which was a distinct hazard was the number of electrical storms. To reduce this hazard, the metal buttons on the workmen's clothing were changed to nonconducting buttons and workmen who were liable to touch metal during their work were obliged to wear gloves to insulate their hands.

A View of the Juniata Crossings Bridge as Completed

"Gray Matter" Helped Pave 12 Miles of Road

Contractor Used Brains Mixed with Concrete to Handle Paving of Stretch of Road Between Selmer, Tenn., and Mississippi State Line

LARGE amounts of brains must be mixed with the concrete on any paving job to get the most economical and profitable results. The J. B. McCrary Engineering Corp., Atlanta, Ga., whose bid of $247,836.13 was the low, put a lot of thought into the location of the batcher plant set-ups and the sequence of paving the 12.471-mile grade known as Project 212-A in McNairy County, Tenn. Work on this 18-foot slab with a cross section of 8-6-8-inches was started with the fine grading on April 11, 1930, and the actual pouring of concrete on April 14, 1930. The contract allowed 125 working days for the completion of the concreting and shoulders. The unit price for the concrete slab was $1.84 per square yard and the shoulders $350.00 per mile. This latter item was done by subcontract. The rough grading was completed under another contract the previous year and as the right of way was new the problem of traffic-handling was absent. All vehicles were detoured around the section on which work was in progress, although the sections completed were opened to local traffic when the period of curing was ended.

Preparing the Subgrade and Forms

A labor organization of 16 men who were divided under a foreman for fine grade and another for form setting handled all the hand work. The mechanical equipment included a Buffalo-Springfield 10-ton gas roller with a scarifier which ripped up the subgrade. The fine grading was done by the Russell 12-foot blade grader which was pulled by a Monarch 50 tractor. A Lakewood scarifier pulled by a tractor was also used.

When the 4,000 feet of Blaw-Knox forms and the 1,000 feet of Truscon forms were set the Buffalo- Springfield gas roller pulled the Lakewood subgrader over the grade to prepare it for the final hand dressing. A 5-ton tandem gas roller was used between the forms.

Well-Planned Batching Layout

The batching plant was located at Guys, Tenn., at about 3 miles from the south end of the job. From this set-up, the slab from a point 5 miles from Selmer for a distance of 4 miles was poured, which brought the slab to the road which led 3 miles out to the batchers. The next section paved was from the Mississippi State line to the batcher road, a distance of approximately 3 miles. Then the batchers were moved to Selmer and the remaining 5 miles poured, working from the first completed section into Selmer.

The sand and gravel used were shipped in by freight from the Tennessee River and unloaded by a Koehring crane with a ¾-yard Blaw-Knox clamshell bucket. The material was unloaded to stockpile or under the most favorable conditions direct to the Blaw-Knox bins with weighing batchers.

The batching plant operating force consisted of 3 men in the cars cleaning up, one of whom oiled the crane. There was one batch man and 4 men in the cement car, 2 cutting bags and 2 tossing them onto the batch trucks. The trucks backed under the batcher and then pulled out about 300 feet for the cement.

The hauling of the batches was done by a subcontractor who used thirty 1-batch Ford, International and Chevrolet trucks and one 2-batch White truck. The trucks were turned on a Blaw-Knox turntable

ahead of the paver and backed to the skip. Two men climbed onto the truck before it was turned on the turntable and emptied the cement onto the batches.

No Labor Wasted Pouring the Slab

One boy was kept ahead of the paver cleaning the forms after they had been lined up by 3 men of the form-setting gang. The same boy also oiled the forms with a brush. One man spotted and dumped the trucks into the skip of the Rex 27-E paver. The operator of the paver oiled the machine during the day and the night watchman attended to the thorough greasing and oiling at night. The individual batches averaged 2,279 pounds of gravel, 1,337 pounds of sand and 6 bags of cement. There were 2 men handling the earth picked up by the Koehring planer pulled by the paver. These same two men also set the Truscon center steel and sprinkled the subgrade. Two men handled the puddling with one man spading one side against the forms and the operator of the Ord finishing machine spaded the other side. Behind the finishing machine 2 men used a 12-foot longitudinal float from a twin bridge on rollers and spaced 14 feet apart. The same two men also used the second longitudinal float which was 10 feet long and operated immediately behind the first. Two men used the two flat canvas belts for the final finish of the pavement slab.

An interesting note on the operations of the men handling the longitudinal floats was found in the use of grout shovelled from in front of the second screed of the Ord finisher for touching up low spots brought out by the floats. The grout was carried along as needed in a bucket and then thrown onto the slab at the points where the longitudinal float showed it to be a bit low. It worked out very well indeed as there were very few cases where the straight-edge showed any low spots or where the check of the inspector showed any high spots the next day.

Expansion Joints and Reinforcing

A 2½-inch open expansion joint was left every 500 feet in the slab and was poured with asphalt by the contractor after curing was completed.

Two 12-foot reinforced slabs were poured on either side of each bridge to take care of any unequal settlement between the fill and the bridge abutment. A 2-inch open joint was left between each slab and the adjacent slab or the bridge.

Water Supply and Curing

A single creek with a low flow of water which was dammed up to provide a sump for the two Barnes gasoline pumps furnished the water for mixing and for curing. The water was pumped as much as 4 miles through the 2½-inch water line with taps at 300-foot intervals. About 200 feet of 2-inch rubber hose was carried on the paver. As this was a Federal Aid project the work was not entirely under the control of the State Engineers. A part of the concrete for the slab was mixed for 1 minute and the remainder for 1¼ minutes. A team and wagon was used to bring up the forms when pulled and the burlap for curing when removed before the earth cover was placed.

Two men placed the burlap on the slab after the straight-edging was complete. They were assisted by one man who also sprinkled the burlap for the remainder of the day in which it was placed. The earth cover was placed by a gang of 10 men with another group of 6 men who sprinkled the cover for 10 days. The earth was not removed for an additional 10 days when the slab was opened for traffic.

Personnel

This contract was completed by the J. B. McCrary Engineering Corp., Atlanta, Ga., for which E. D. Fambrough was Superintendent. The work was done under the direction of Z. B. Thompson, Resident Engineer, with C. M. Templeton as Inspector for the Tennessee Department of Highways and Public Works.

Our February Front Cover

THE front cover of this issue of CONTRACTORS AND ENGINEERS MONTHLY is reproduced from a crayon sketch by A. Rappaport, 45 Astor Place, New York. Mr. Rappaport's services are available to manufacturers, advertising agencies and others who wish crayon drawings for catalogs and pamphlets prepared from photographs or sketched on the job.

BUILDING ANOTHER CONNECTING LINK BETWEEN TENNESSEE AND MISSISSIPPI

1. *"Taken for a ride," by the Lakewood subgrader pulled by a Buffalo-Springfield roller.* 2. *Looking up at paving operations from the bottom of a fill.*

Sluice Replaced Pipe Sewer During Bridge Construction

By
Thos. H. Wittkorn

LAST summer the New York State Division of Highways decided to have a new bridge built over Sonyea Creek on the line of the concrete highway which connects Dansville and Mt. Morris, part of one of the important through roads to Buffalo. The greatest problem to be solved was how to take care, during the construction period, of an 8-inch sewer which was being carried over the creek by the old bridge.

This sewer is one of the vital parts of the Craig Colony, a State institution for epileptics, which is located on both sides of the creek. Nearly two thousand women patients and the scores of attendants for them as well as the laundry for the entire colony are dependent on the continual operation of the sewer which runs two-thirds full most of the time.

Several factors had to be considered before a decision was reached as to how the line was to be taken out of the way of the contractors. The creek to be spanned looked harmless enough but it has been known to rise 4 to 5 feet in as many hours. When the plan of syphoning was suggested the possibility of pollution was presented and this had to be discarded. Another fact which made the task more difficult was the knowledge that there was only 0.3-foot drop in the 365 feet of sewer line which had to be cared for.

Sluice Carrying the Sewer Over Sonyea Creek, Livingston County, N. Y., to Allow for the Bridge Construction

A Gould Rotary Pump Driven by a Caterpillar Tractor Taking Water at the Rate of 1,000 Gallons per Minute Out of the Cofferdam During the Construction of Concrete Abutment for the New Bridge

Sluice Solves the Problem

It was finally decided that an elevated sluice was the best plan to adopt, although it was pronounced impractical by nearly everyone. In operation, however, it has been very successful and was not unduly expensive. The sluice was made out of partially green oak planks, 2 x 12's, 12 feet long, spiked together so that the bottom measured 10 inches and the sides were 1 foot high. After it was put into place the inside was given a pouring pot dose of the ordinary bitumin used on roads so as to make it water tight.

Somewhat over 200 feet of the line had to be carried across the creek valley on a high level, and native oak and beech pilings were secured for this purpose. They were 24 feet long and had to measure not less than 1 foot at the butt. These were driven 3 feet into the ground and spaced in pairs so that each 12-foot section of the sluice would have two supports. On each end of the line for 50 feet or more it was not necessary to use the pilings.

The contract for the erection of the new bridge was awarded to Curry & Macy, Inc., Dansville, N. Y., but this firm was in no way responsible for the maintenance of the sewer during the building of the new structure. The new bridge has concrete abutments and a plate girder span of 103 feet. When it is finished the sewer will be carried by it.

To get the water out of the cofferdam while building the abutments, a Gould rotary pump was used which received power by a belt from the power pully of a Caterpillar tractor.

O. J. Pierce assisted by C. Daggert were the State engineers charged with the responsibility of the successful fulfillment of the projects.

The Contractor's Balance Sheet

By
J. E. Gregory, C. P. A.

Farrington, Hyland & Gregory

Certified Public Accountants

New York City

THE present method of accounting for contracts adopted by many accountants is that of carrying in one net figure under "Costs of Jobs in Progress," the excess of the total costs over the total of the receipts or requisitioned amounts to date, by contracts. Although this method has the advantage of generally deferring profit or loss computations until the contracts are completed, there is the danger of taking profits as soon as the receipts or requisitioned totals exceed the costs, and before contract completion. Such procedure is not fully indicative of the complete status of contractual relations at any time, in a rational method of account keeping, as hereinafter explained.

Errors of Omission and Commission

In the field of audit procedure, it is primarily the duty of the auditor to establish the financial position of his client at a given date. Generally the records of the client, applicable particularly to contractors, are valuable in determining current financial conditions, but fail to disclose the matter of future commitments. In the contracting business, these future commitments, similar to purchase and sale commitments in a merchandising institution, are represented in the unrequisitioned balances of "Signed Contracts Receivable" and "Signed Subcontracts Payable." The preparation of a statement of finances that fails to take full cognizance of all matters of contractual commitment not only is incomplete, but in nearly all cases portrays an absolutely untrue financial picture.

The principal reason for these omissions may be directly traceable to the methods of accounting and the failure on the part of the bookkeeper to properly record, if at all, all contracts immediately upon their being signed. As the borrowing capacity of a contractor is determined not only upon his current financial position, but principally upon his signed contract future, it is evident that contracts should not only be made a matter of immediate book entry when signed, but should be financed separately, a matter to be further discussed in a subsequent article.

The second of a series of articles by Mr. Gregory to appear monthly during 1931, *covering tax, accounting and system problems as applicable to the contractor. Particular problems relative either to methods of accounting or tax matters may be directed to the offices of Farrington, Hyland & Gregory, Certified Public Accountants, Chrysler Building, New York City, or to the offices of* Contractors and Engineers Monthly, 470 *Fourth Avenue, New York.*

Accounts and Entries Required to Record Contractual Relations

The following accounts should be carried upon the general ledger of all contractors:

Debit Accounts

- Accounts Receivable—Due on Requisition
- Cost of Jobs in Progress
- Subcontracted Job Costs—Unrequisitioned Balances
- Material Costs—Purchase Contracts—Unbilled Balances
- Signed Contracts Receivable—Unrequisitioned Balances

Credit Accounts

- Accounts Payable—Open Purchase Accounts
- Accounts Payable—Material Purchase Contracts Billed
- Subcontracts Payable—Due on Requistions
- Signed Subcontracts Payable—Unrequisitioned Balances
- Accounts Payable—Material Purchase Contract Commitments—Balances
- Reserve Covering Uncompleted Contracts

Let us assume the following events: On January 15, 1930, the contractor signed a contract to perform a certain piece of work for $750,000; on January 18, 1930, $350,000 was sublet to subcontractors; purchase contracts for material requirements were signed to the amount of $120,000; to date of February 15, labor had been paid a total of $32,000; unpaid materials purchased were $18,000; other costs paid aggregated $2,600; contract creditors had billed $12,000 for materials delivered against $120,000 of contracts; on February 15, the contractor requisitioned $90,000; on February 16, subcontractors requisitioned $35,000; on February 25, the contractor received $81,000, which is $90,000 less 10 per cent retainer; on February 26, the contractor paid $31,500 to subcontractors, withholding $3,500 as a 10 per cent retainer.

The entries and accounts utilized to record these financial events are as follows:

Date	Account	Dr.	Cr.
Jan. 15, 1930	Signed contracts receivable—unrequisitioned balances	$750,000.00	
	Reserve covering uncompleted contracts		$750,000.00
Jan. 18, 1930	Subcontracted job costs—unrequisitioned balances	350,000.00	
	Signed subcontracts payable—unrequisitioned balances		350,000.00
Jan. 18, 1930	Material costs—purchase contracts—unbilled balances	120,000.00	
	Accounts payable—material purchase contract commitments—balances		120,000.00
Feb. 15, 1930	Cost of jobs in progress (labor)	32,000.00	
	Cost of jobs in progress (material)	18,000.00	
	Cost of jobs in progress (other costs)	2,600.00	
	Cash (labor paid $32,000.00—other $2,600.00)		34,600.00
	Accounts payable—open purchase accounts (contract No. 1)		18,000.00
Feb. 15, 1930	Cost of jobs in progress (materials)	12,000.00	
	Material costs—purchase contracts—unbilled balances		12,000.00
	Accounts payable—material purchase contract commitments—balances	12,000.00	
	Accounts payable—material purchase contracts billed		12,000.00
Feb. 15, 1930	Accounts receivable—due on requisition	90,000.00	
	Signed contracts receivable—unrequisitioned balances		90,000.00
Feb. 16, 1930	Signed subcontracts payable—unrequisitioned balances	35,000.00	
	Subcontracts payable—due on requisition		35,000.00
	Cost of jobs in progress—(subcontracts)	35,000.00	
	Subcontracted job costs—unrequisitioned balances		35,000.00
Feb. 25, 1930	Cash (or bank account)	81,000.00	
	Accounts receivable—due on requisition		81,000.00
Feb. 26, 1930	Subcontracts payable—due on requisition	31,500.00	
	Cash		31,500.00

A resume of these entries will reveal a Balance Sheet presentation at the close of business on February 26 as follows:

BALANCE SHEET OF A CONTRACTOR ON FEBRUARY 26, 1930
(Based only upon foregoing data)

ASSETS

Cash		$ 14,900.00
Accounts Receivable—Due on Requisition		9,000.00
Costs of Jobs in Progress:		
Labor	$32,000.00	
Materials	30,000.00	
Subcontracts Requisitioned	35,000.00	
Other Costs	2,600.00	99,600.00
Cost of Jobs Subcontracted—Unrequisitioned		315,000.00
Material Costs—Purchase Contracts Unbilled		108,000.00
Signed Contracts Receivable—Unrequisitioned Balance		660,000.00
Total		$1,206,500.00

LIABILITIES

Accounts Payable—Open Account	$ 18,000.00
Accounts Payable—Material Purchase Contracts Billed	12,000.00
Subcontracts Payable—Requisitioned	3,500.00
Signed Subcontracts Payable—Unrequisitioned Balance	315,000.00
Accounts Payable—Material Purchase Contract Commitments	108,000.00
Reserve Covering Uncompleted Contracts	750,000.00
Total	$1,206,500.00

QUERIES AND GENERAL REMARKS

Do your records reveal the above information? With regard to the above information are your general ledger accounts analytical to the extent of showing all information either receivable or payable, entered by jobs? Can you determine the extent of gross profit or loss from the foregoing facts?

It is sufficient to say that, not only should these facts be available to the contractor as a student of his own business progress, but for the obvious reason that without the entire portrayal as shown, the matter of financing becomes pure guess-work. Funds become diverted into improper channels, haphazard expenditures become commonplace, and the responsibility of trusteeship attending the exercise of any sizable contract becomes lost to sight.

Two Prominent Construction Organizations Affiliate with Merritt-Chapman & Scott Corporation

MERRITT-CHAPMAN & SCOTT CORP., 17 Battery Place, New York, N. Y., sea salvors, marine and general contractors, has announced an extension of its construction service making it possible to handle projects of any magnitude throughout the western hemisphere, inland or seaboard, through the formation of two new subsidiaries, the Merritt-Chapman & Williams Corp., affiliated with W. Horace Williams Co., Inc., New Orleans, and the Merritt-Chapman & Whitney Corp., affiliated with Whitney Brothers Co., Duluth and Detroit.

William H. Baker, President of Merritt-Chapman & Scott Corp., is Chairman of the Board of Directors of both subsidiaries, which will be operated, however, wholly as self-contained units under the direction, respectively, of W. Horace Williams as President of the New Orleans corporation and of Gwin A. Whitney as President of the Duluth corporation. No change whatever is contemplated in policy, personnel or management from those which obtain in their old established affiliates.

This expansion of the construction facilities of the Merritt-Chapman & Scott Corp. implies in no way any lessening of the parent corporation's interest in salvage. The salvaging of distressed vessels is an essential function of the shipping industry in which the organization has attained large responsibilities.

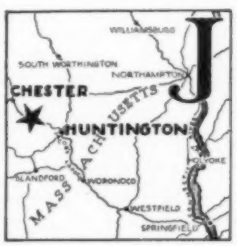
The W. Horace Williams Co., Inc., is thoroughly familiar with building conditions throughout its section and with predecessor companies directed by Mr. Williams has done some of the most important engineering-contracting work of the past 25 years in the south, in Mexico and in South and Central America. All along the Gulf Coast and in Mexico that organization has built terminals to the value of millions of dollars and on the Mississippi River from Memphis to the Passes, it has constructed wharves and terminal facilities for a very large proportion of the industries. It has built many of the principal buildings in the larger cities of the south and in New Orleans. Offices are maintained in New Orleans, La., Tampico, Mex., Mobile, Ala., Houston, Texas, and Pensacola, Fla.

Whitney Brothers Co., since its establishment in 1889, has carried out a great variety of large work in different parts of the country though its particular field is the Great Lakes and the northwestern states. Many of its operations have been of a character to attract attention, the most unusual of these projects doubtless being the building of the underwater section of the $22,000,000 international tunnel connecting Detroit and Windsor, Canada, recently dedicated, in which engineering methods of considerable originality were developed and utilized. Work of importance has been done for the city of Detroit, including the construction of a 20,000,000-gallon reservoir and the foundation for the municipal filtration plant at the Springwells Station. It has specialized in the construction of the highly developed ore docks in the Great Lakes area and has done a great deal of work for the railroads and other transportation interests. Complete facilities are maintained for the design and construction of the company's own marine equipment, derricks, pile drivers and dredges. Considerable work of this kind has been done for others, including ten steel ocean-going tugs for the United States Government. Offices of the Whitney Brothers Corp., now the Merritt-Chapman & Whitney Corp., are at Duluth and Detroit.

A complete organization for both marine and general contracting is maintained on the Pacific Coast at San Pedro, Port of Los Angeles, with offices also at San Francisco. This unit is equipped with floating derricks, dredges and all other requisite service craft to perform the various kinds of marine service as well as a plant for general construction. Other subsidiaries of the Merritt-Chapman & Scott Corp. have been active in Canada and in Jamaica, B. W. I., for some years.

Paving Jacobs Ladder *with* Bituminous Macadam

Lane Construction Company Placed 600 Tons of Stone per Day for Mosaic Top Without Seal Coat



JACOBS LADDER, the Mohawk Trail and the College Highway are all names familiar to travellers in New England for they designate highways that are famed for scenic beauty and, in the last two years, for the remarkable bituminous macadam pavements of the rough surface texture type that are so successfully built in Massachusetts. On U. S. Route 20 between Huntington and Chester, Mass., leading to the well-known Jacobs Ladder that spelled anathema to automobiles in the one-lung days, the Lane Construction Co., Meriden, Conn., this last year built 4.3 miles of 7-inch bituminous macadam highway varying from 24 to 44 feet wide over an old 15 to 18-foot bituminous-treated macadam. The chief feature of this pavement was that it was built without the usual seal coat.

Work Started in October, 1929

Clearing and grubbing on the 3,400 feet of relocation, and drainage work and bridges was started early in October, 1929. This work was continued until the middle of January and then stopped until seasonable weather. The placing of the stone was begun on June 9 and completed in exactly two months.

The earth excavation ran to 29,000 yards; rock, 15,000 yards; gravel borrow, 28,100 yards and the stone for the two courses, 27,200 tons. A total of 190,000 gallons of Socony asphalt was used for the penetration. There was no detour for this job so traffic was maintained throughout the work by keeping one-half of the road open and permitting one-way traffic controlled by the flag system.

A considerable amount of drainage pipe was installed and some old cast iron culverts replaced in new locations. The diameters and amounts of the vitrified clay pipe, reinforced concrete pipe and the cast iron pipe removed and relaid were as follows:

Vitrified clay	12-inch	2,210 feet
Reinforced concrete	12-inch	2,434 feet
	18-inch	847 feet
	24-inch	173 feet
	30-inch	102 feet
	36-inch	53 feet
	48-inch	49 feet
Cast iron (removed and replaced)	12-inch	315 feet
	18-inch	75 feet
	36-inch	24 feet

Six-inch vitrified clay pipe side drains were laid with open joints for 3,948 feet and covered with the bottom course stone which ran from ¾-inch to 2½-inch.

New and Widened Bridges

There was one large bridge with a 24-foot span on a 32-degree skew and 40 feet wide. Three old bridges were widened from 18 feet to 35 feet and the abutments carried to 45 feet to permit further widening when needed.

The skew bridge was built in the fall and had several unusual features. The reinforcing was placed at right angles with the abutments which left the triangular sections at either side without as much support as the center section. To overcome this weakness the rails at the two sides were designed as part of the beams and poured monolithic with the slab. The rails were given a 3-inch camber when the forms were built and the resulting rails had a 2-inch camber due to the slight settling of the forms. Inasmuch as the space below the bridge was for a railroad serving a quarry,

INTERESTING DETAILS OF CONSTRUCTION

1. The front of the Wehr one-man grader showing the far wheel "shod" with an old motor truck tire to prevent side slipping. The other member of the pair had completely worn out. 2. Hand casting the sand binder on the base course. The completed half of the road is seen at the left. 3. Sweeping the sand binder by hand to insure uniform distribution. 4. The base course complete with sand binder and rolled ready for the top stone.

it was impossible to use as complete falsework to support the forms as would ordinarily be built as sufficient clearance had to be maintained for the freight cars which used the track regularly.

The concrete for the structure was batched close by with an Erie AggreMeter plant served by an Insley crane with a ½-yard clamshell. The batches were hauled in Ford one-ton trucks to the Ransome 5-bag mixer and carried to the forms by an Insley mast plant with chutes.

HEAVY GRADING

Three Erie steam shovels, one a 1-yard machine and the other two ¾-yard machines, were used for the heavy grading and excavation in the gravel borrow pits. No stone was placed on the road until the grading was complete for the full width. The scheme of operation was, when near a gravel pit, to complete the excavation for one-half of the road with the shovel, then run it into the nearby pit, excavate the gravel borrow for the 12-inch subbase and then run it out to complete the excavation for the second half and into the pit again for the gravel borrow for the second half.

About 15 hired trucks were worked on the earth, rock and gravel excavation. The gravel was hauled a maximum of 3 miles and the earth and rock haul averaged much less, with a maximum of 1,000 feet. Two Caterpillar Thirty tractors with bulldozers were used to spread the gravel base. Because of the number of large stones from the pit, the one-man graders could not handle them satisfactorily. A total of ten men was used on the gravel borrow, particularly to remove the large stone as brought up by the bulldozers. There were three or four men with each shovel and an additional ten men on the heavy cuts for trimming. On the bridge job the labor ran two carpenters and about twelve laborers. The maximum labor on the payroll was in the latter part of June when as high as 150 men were employed, the average for the entire job was about 120 men.

PLACING THE STONE

The lower course of trap rock from ¾-inch to 2½-inch was spread 4½ inches deep on the 12-inch foundation of gravel, at the rate of 0.22 tons per square yard. This was rolled to 4-inch thickness and ground with sand by repeated spreading and brooming during rolling. The brooming was done by gang brooms attached to the two 12-ton Buffalo-Springfield gas rollers and the two steam rollers and also by rattan hand push brooms. Rolling was continued until no movement showed under a 14-ton stone truck. The sand was spread lightly and repeatedly to fill the voids and yet avoid bunching or "floating" of the stones. A final brooming just ahead of the top stones was given to compensate for atmospheric conditions that might give an excess of damp sand or a deficiency of dry sand. One man did this touching up throughout the whole job and did very sat-

isfactory work, getting very uniform results.

All stone came from a quarry in Westfield, Mass., which had a vibrating screen which seemed to pass more of the larger stones than permitted by the specifications. Because of this the maximum size was cut from 2½ inches to 2 inches. The quarry was operated by John S. Lane & Sons and the material was shipped to the job by rail and unloaded direct to the trucks by a Burch belt-type unloader from a pit beneath the cars.

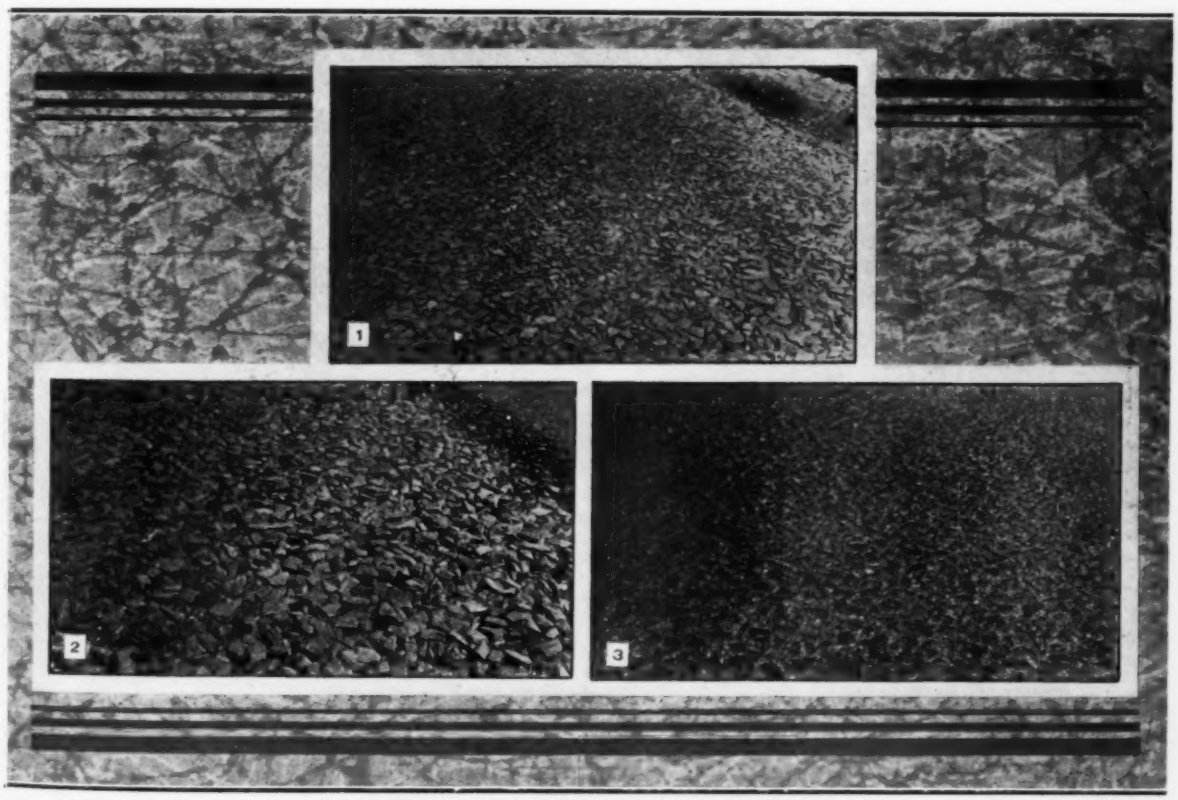
The stone was placed by dumping from the trucks directly to the road and using two one-man graders, a Galion and a Wehr, to spread it. At first the contractor was doubtful that this would prove as successful and economical as the use of spreader boxes but after a fair try it was found to be entirely satisfactory. The graders cut the hand labor usually required for this work from twelve to six men, all of whom used forks for touching up.

The fine grade gang of six or seven men was pulled back when required to handle the hand casting and brooming of the sand for binding the bottom course, and later for spreading the ½-inch stone after the penetration.

An interesting detail in connection with the use of the one-man graders was the inability of the machines to operate successfully on the heavy grades where the curves were superelevated 1 inch per foot of width. On one of the curves with a 100-foot radius, the machines were stuck as the front wheels, having no traction, simply slid over the stone and the machine could not be steered. The condition was akin to the difficulties experienced by steam rollers about three years ago on some of the new gravel fill in Vermont. The hard round gravel provided no traction for the wheels of the heavy machine which actually skidded in a most terrifying manner until laborers threw birch saplings under the rolls. The operator of the one-man grader on this job did not use saplings but showed ingenuity in applying old motor truck tires, wiring them on to the front wheels, and the results were immediate. The graders steered as satisfactorily as though they had the rimmed wheels which are provided for use in cases like this. The rimmed wheels could not be used here as the grader was called upon frequently to run over the completed road and the rims would have cut up the surface badly.

The top course of trap rock from 1¼ to 2½-inch sizes was then spread at the rate of 0.17 tons per square yard to be 2½ inches thick after rolling. The stone was dumped roughly to place from the trucks and then spread to grade by the motor grader, as with the base course. A foreman and five laborers spread the stones behind the grader. This gang spread 27,000 tons in two months.

Immediately after the hand spreading, but not less than 300 feet at a time, the stone was ironed out by a 12-ton gas roller and then carefully inspected by the engineer for any irregularities that the initial rolling might indicate. These were corrected and rolling re-



A STUDY IN BITUMINOUS MACADAM TEXTURES

1. The bottom course rolled and before spreading the sand binder. 2. The top course rolled. Notice the use of all coarse stone in the top layer before penetration. 3. The completed surface penetrated and with the application of the ½-inch stone in excess. As shown the pavement has been under traffic for some time so that the mosaic has been well-developed through the grinding of the small surface stone and the sweeping of the excess to the shoulders by traffic.

sumed until the full mechanical bond was obtained. One man did all the final spotting and one man all the final rolling, giving very uniform results.

APPLYING THE ASPHALT

Socony asphalt, Binder C, was shipped from Providence, R. I., in insulated tank cars and heated at Chester, Mass., by a horizontal boiler and then pumped to the Etnyre tank truck distributor with a steam-jacketed pump. The asphalt was applied at the rate of 2½ gallons per square yard. The distributor applied 250 gallons a minute to the road surface at a pressure of 65 pounds per square inch at a uniform temperature of 340 degrees Fahrenheit. One distributor handled 190,000 gallons without a single mechanical failure. One crew of two men operated the distributor with very satisfactory and uniform results. The control of these operators was so good that the use of the drip box for starting the application of the asphalt was dispensed with. The State Engineers in charge believe that the use of the drip box condones poor work on the part of the asphalt men, so they put it up to them to apply the asphalt in the best manner possible. That this was done was shown by the lack of "fat" places where the loads started and stopped and the absence of rich streaks between the two strips of the paving. The good work is attributed to the care of the operator, the texture of the stone, and the temperature of the asphalt when applied. The cut-off baffle on the distributor also helped in preventing an overlapping of the applications along the center line.

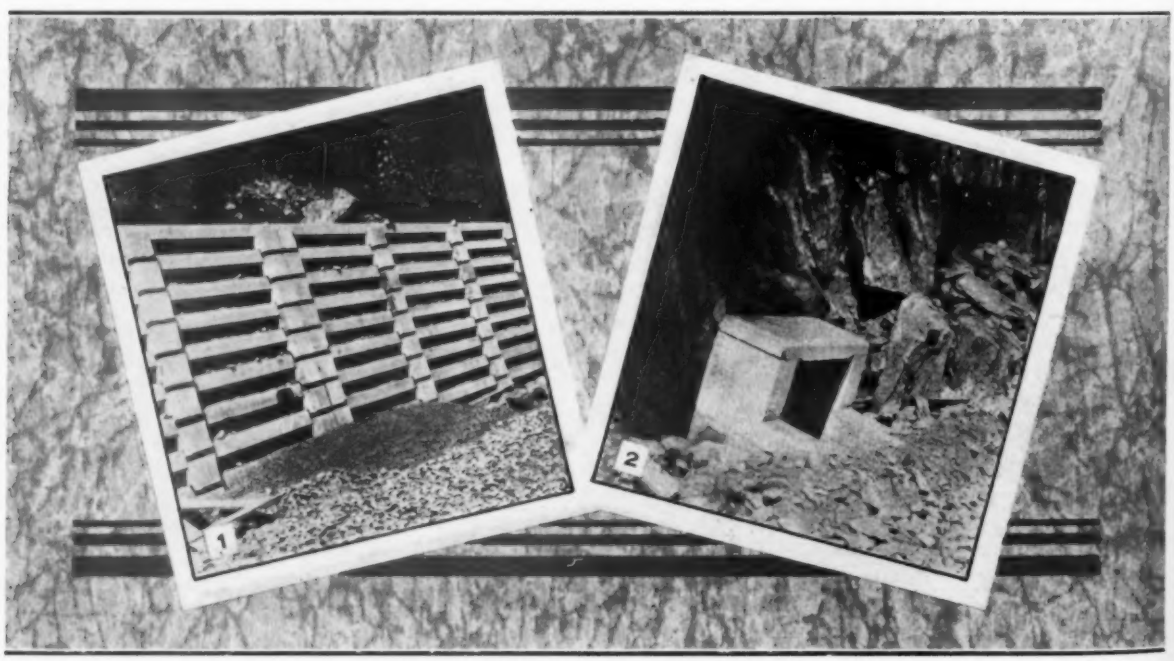
Immediately following the application of the asphalt, gas rollers equipped with water spray bars began at once to roll the surface. In very hot weather a small amount of pea stone was spread for the initial rolling, followed by a very light covering of the same ¾-inch stone. Brooming was begun at once to avoid any tight or open spots. If the weather was too hot to permit rolling out surface creases, the rolling was discontinued and no more pea stone added until conditions permitted the final rolling. An excess of pea stone during rolling and until the surface had been fully compacted was avoided to prevent "choking" and to insure a good mechanical bond among the surface stones. After the final rolling, and not until then, the surface was completely covered with pea stone. Because of the repeated spreading and brooming, the interstices were completely filled and a surface excess of pea stone existed. Traffic was allowed to use the surface 24 hours after the application of the asphalt.

The action of traffic on the excess pea stone served two purposes: first, to compact the pea stone filler and force it down into the lower interstices where it acted as a key to maintain the mechanical bond; the other purpose was to remove, by abrasive action, the surface pea stone so that each individual larger stone in the road stood out in relief, furnishing a true mosaic non-skid surface. Only that portion of the pea stone filler that is below the surface enough to escape this direct abrasive action remained after a few weeks. The remainder of the pea stone was pulverized and removed by the traffic.

HEAVY WASH FROM HILL

At one point in the project there was a hill of a form of quicksand that washed speedily into the road with every rain. In the spring when there was an excess of water the wash swept across the road on several occasions. In order to prevent a recurrence of this after the pavement was completed, about 300 feet of Massey concrete cribbing was installed and backfilled. Behind

(*Continued on page 64*)



NOVEL DRAINAGE STRUCTURES

1. The highest portion of a long section of Massey concrete cribbing, erected to check a flow of quicksand from high up in the hill, directing the flow laterally to a covered inlet at one end. 2. A drop inlet at the base of a ledge.

Who Sells *You* Road Machinery?

By

Edward L. Kropp

Manager, Western Road Machinery Company, Portland, Oregon

BUSINESS founded on the principle of doing everything to keep customer confidence must succeed. It must succeed because customers force it to succeed. They return with business year after year, in ever-increasing volume, because it is to their own interests. They save money by dealing with such a firm because the machinery purchased gives adequate value for every dollar spent. And value is based on usefulness and not on original price.

There is no surer way to cut down the cost of road making and general contract work than by remembering this fact and applying it when buying rock-crushing plants, graders, shovels and other road-building machinery.

More money is wasted and more "gypos" encouraged by the slackness with which contractors select the firms from whom they buy, than anything else.

When a contractor insists on a price reduction in return for an antiquated, worn-out "trade-in", he forces the equipment dealer to do two things: first, the dealer must carry a cheaply constructed line with a low factory cost; second, he must mark up his price tags to take care of "trade-in" allowances.

If this were all, it wouldn't be so bad. The contractor would simply be buying cheap equipment at a high price. But it does not end here. In order to get rid of the "trade-in" junk, the dealer must find someone who will buy it. Naturally, he must turn to the "gyp" who, with $1,000 saved up from wages earned as an operator, goes into active, price-cutting competition with the man who originally turned in the equipment. With no overhead, the "gypo" underbids the legitimate contractor and takes away many otherwise profitable jobs which by all rights should be handled by established firms.

Ralph D. Winstead, editor of *The Constructor*, recognizes this menace and has made it the subject of an editorial.

"Small wonder that irresponsible contractors are pushed into business," he says. "The shrewd individual bargain, because of necessity, starts a chain of events that react so disastrously to responsible contractors as to cause losses many times as great as the individual petty gains made in driving through such trades.

"The trade-in bargain hunter in equipment can depend on it that every piece of junk he unloads on a dealer is going to hit right back at him through newly created irresponsible competition. It is going to hit back with disastrous effects on his profits."

The Four-Way Test

The "gypo" menace has grown year by year, until it has threatened the very lives of thousands of legitimate contractors. The only effective means of striking at this parasite is by cutting off his supply of cheap equipment. That means dealing with an equipment house that is doing business on a straight-forward, open-book policy—a house that has nothing to sell the "gypo."

How Is the Contractor to Select His Equipment Dealer?

The only way for a purchaser, whether an independent operator or a county official, to protect himself, is to set up a standard by which to judge the dealer from whom he buys.

First, does the dealer juggle prices, give special concessions, take in old, useless equipment as partial payment on new? Or does he operate on a fixed margin above the manufacturers' cost, thereby delivering a dollar of value for every dollar marked on the price tag?

Second, does the dealer encourage the "gypo" or is he working for the benefit of the legitimate contractor by making it impossible for price cutters to undermine legitimate firms?

Third, does the dealer maintain confidence by living up to his guarantees? Does he do everything possible to give the operator the kind of service he wants, regardless of circumstances?

Fourth, are the dealer and his representatives expert advisers, men who can help you solve your problems? Or are they merely high-pressure salesmen? Some representatives have saved their customers thousands of dollars by suggestions and advice which had nothing to do with selling their line. Other salesmen are merely good talkers. They have "read the book" and know little of practical value. Deal with the man who knows

his business from the ground up.

Use this four-way test to size up the man to whom you give your orders. If he measures up you are far on the way to cutting road construction costs with safety, because he can help you do more with a smaller investment and thus increase your profits.

ONE PRICE TO EVERYONE

A number of years ago, we saw the disaster which lay ahead if the machinery distributors were to continue their old practice of price-cutting. The Western Road Machinery Co., adopted a strict policy of one price to everyone and that price based on a reasonable operating margin above the manufacturer's list price. All padding was eliminated from their price tags. Nothing was added to take care of bad deals and trade-ins.

This was a radical step. It took nerve to pioneer such a policy. But we saw the hand writing on the wall and went ahead, depending on constructive salesmanship and the fair-mindedness of the legitimate operators. Firms in other fields were doing the same thing. About that time H. J. Heinz was implored by his salesmen to put out a 10-cent can of tomatoes. At that time the Heinz product was a 12-cent seller, and his salesmen thought that if they had a cheaper brand it would be a simple matter for them to meet the lower-priced competition. But Mr. Heinz would have none of it. "Don't you know," he said, "that the reason this business has been successful is because we don't have a 10-cent can to sell? We don't want to put ourselves in the '10-cent' class. Sell quality and the price won't matter."

Paving Jacobs Loader

(*Continued from page 62*)

this a drainage system was laid out leading to a drop inlet at the end.

PERSONNEL

This Federal Aid project was built by the Lane Construction Co., Meriden, Conn., with E. A. Gordon as Superintendent. For the Massachusetts State Department of Public Works, the work was in the charge of D. L. Costello, Supervising Resident Engineer and John F. Casey, Resident Engineer.

Moving 1,500,000 Cubic Yards of Solid Rock

AT Beauharnois, Quebec, on the St. Lawrence River, 22 miles below Montreal, one of the largest power developments in America is under way. A diversion canal 15 miles long and a power house harnessing the St. Lawrence are being built to produce 500,000 horsepower. The site permits an ultimate installation of 2,000,000 horsepower.

The power canal is over half a mile in width and is designed so that ultimately it could divert the entire flow of the St. Lawrence River. The canal takes water from the St. Lawrence near the city of Valleyfield, Quebec, then curves to the south of the river and swings back into the St. Lawrence to the west of the town of Beauharnois where in a single stage development will be concentrated the full head of 83 feet of water with an installation of 500,000 horsepower.

In the tail-race excavation alone the Beauharnois Construction Co. is removing over 1,500,000 cubic yards of solid rock at a rapid pace. This contractor has nine churn blast hole drills busy day and night drilling the thousands of feet of hole required for the huge blasting operations, breaking up the rock to be moved by the power shovels.

The drilling schedule calls for 10,000 feet of hole per month, and there have been few months that the total footage has fallen below this mark. The holes are drilled 6½ inches in diameter to an average depth of 45 feet. The deposit is a hard silica sandstone. The holes are spaced 15 feet on centers for blasting.

Because of the hardness and abrasive character of the rock, the bits wear rapidly, requiring frequent resharpening. In order to keep plenty of sharp bits in service, three Armstrong bit sharpeners are installed. These machines, each operated by one man, sharpen an average of 30 to 40 bits every day.

A daily drill report is kept by each crew which is turned in to the drill foreman at the end of every shift, so that he can tell at a glance just how much footage each drill is making per day as well as the cost of the operation. At regular intervals a progress chart is prepared which shows the footage drilled per week or month, the total amount of hole drilled to date, the number of drill shifts per day, the time lost clearing holes, etc., which enables the operating officials to keep in close touch with the work at all times.

Frank H. Cothran, Vice President and General Manager of the Beauharnois Construction Co., is in general charge of the enterprise, assisted by D. F. Noyes, Superintendent, and A. A. MacSween, General Foreman in charge of drilling and blasting.

The Blast Hole Battery at Work on the Beauharnois, Quebec, Power Project

How the Other Fellow Did It

Construction Briefs

Winter Construction Methods on a Concrete Dam

74. On a concrete gravity section dam built during the winter, practically the same type of covering was used by the contractor on the small sections as on the heavy mass work. The form sheeting was made of 2-inch lumber, and this had considerable insulating value in itself. The covering for the vertical faces consisted of 4 x 10-foot panels, burlap and tar-paper covered. These were nailed to the main form walers, or placed about 18 inches back from the main form to provide a working space for pipefitters. A 1-inch steam line was run around the form at the bottom and at the center of each lift. The opening between the two forms was covered at the bottom to prevent an upward draft. The top was covered by tarpaulins. Over the large forms the tarpaulins were supported on light frame-work and coke-burning salamanders were placed in shear valleys.

It is recognized that live steam, due to the moisture supplied, provides a better curing protection than dry coils. However, it was found necessary on this job to arrange the piping so that both types could be used on this work. If live steam were used while the placing is in progress, the clouds of steam would prevent the crews from seeing, and the work would become difficult and dangerous. Valves were placed at intervals in the coils so that dry heat could be supplied during the time the form was being filled, and then the valves were opened and live steam supplied when the form was finished and covered. Thermometer wells, made of ½-inch water pipes from 3 to 8 feet long, were placed in the lift while the concrete was soft. These were normally located in three positions in the form: one at the upstream face, one near the center and due at the down-stream face.

When the air temperature was below the freezing point, necessary arrangements were made at the mixing plant to produce concrete having a temperature from 70 to 100 degrees F. It was found that concrete heated to above 100 degrees was in danger of taking a flash-set. On two occasions when the mixture was discharged at 110 degrees the concrete was set up in the buckets before it could be delivered to the forms, a matter of 25 or 30 minutes. It has been suggested that if the cement came into immediate contact with mixing water at a temperature of from 180 to 200 degrees, the chance of a flash-set would be much greater than when the mixing water had first been cooled to some extent by contact with the sand and stone. JACI 27.11.299

Be Prepared to Handle Materials Two Ways

75. A well-thought-out plant layout for handling aggregate on a mixed macadam job in Ontario proved of great value to the contractor. Too many times do contractors plan simply one way of handling aggregate and perhaps even eliminate the stock pile. In this case it was possible for the contractor to use either a derrick and clamshell for handling the stone from his crusher or, as the bin for the crushed stone was built high enough, it was possible for a truck to run under the bin and haul the stone to the mixing plant. This forethought proved valuable when during the operating of the plant a cable on the derrick broke and released the boom, splintering it and making it necessary to replace the boom. During this time the mixer was supplied with stone by the trucks, thus avoiding any delays. 19.3.89

A Compact Floating Concreting Plant

76. A Texas bridge contractor developed a well-conceived and well-designed floating concrete plant for use on the construction of an $800,000 concrete bridge. The plant was mounted on a 32 x 90-foot wooden barge and so arranged that materials from barges could be handled with the minimum of effort in the quickest possible time. When the plant was in operation the sand and gravel barges were lashed together and moored in front of the concreting barge with the cement barge alongside at the left. A derrick equipped with a ¾-yard clamshell was used to load the aggregate from the barges to the steel bins and batchers. The derrick was full-revolving and thus was able to reach in any direction from the setting at the front of the barge. Cement was handled in wheelbarrows direct from the cement barge to a shed back of the derrick by one or two men. One man in the cement shed loaded the cement bags into an elevator which discharged the load onto the mixer platform above. The elevator was operated by the same engine used to place the concrete in the tower through a power take-off. A ½-yard mixer discharged into a concrete bucket which ran up the tower and delivered the concrete to the caps or floor system through a maximum of 50 feet of chute. Water for the mixer was secured through a 2-inch line cut into the city water line, but when the work was beyond this line, a pump mounted on the rear of the barge was used to pump from a water barge moored alongside. The crew used to operate the concreting plant on the barge consisted of one crane man, two men wheeling cement, two men dumping cement into the hopper of the mixer, one man on the batchers who also dumped the mixer and one man on the concrete hoist. 19.11.59

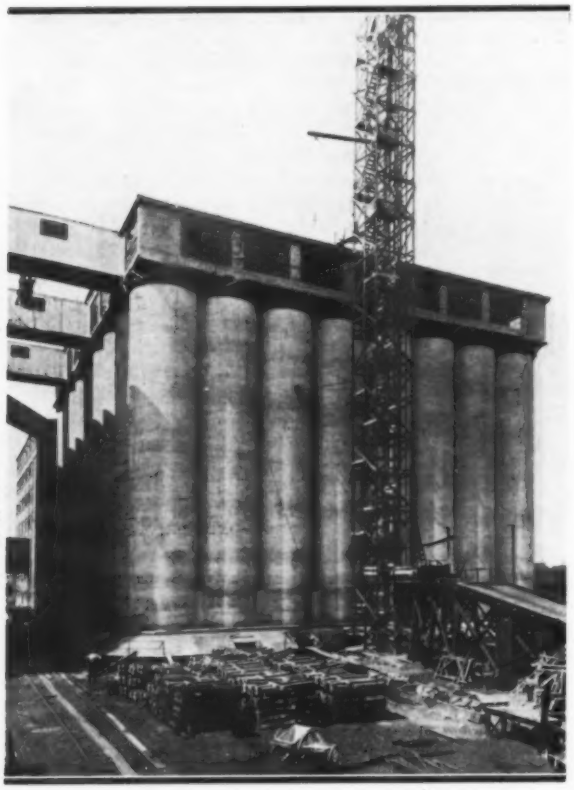
Cleaning a Concrete Trough

77. On a large central mixing concrete plant where the product was delivered from the mixers to a large hopper and thence through a long chute with the concrete controlled by a shutter gate, it was found necessary to clean the chute frequently. This chute which could easily be pushed back by one man to clear the industrial train which hauled the mix away in boxes on flat cars was cleaned each time a bucket was filled by running a semi-circular board attached to a long pole down the chute. This proved more effective than the usual method of endeavoring to push the remaining concrete along with a shovel which does not usually fit the shape. 19.10.53

Conveyor Towed by Paver Places 45 Tons of Concrete in Channel Per Hour

78. The construction of a reinforced concrete lined channel 3,400 feet long, 47½ feet wide, with perpendicular side walls 8 feet high was handled in California in a very interesting manner through the use of a 27-E paver and a portable belt conveyor, thus eliminating the use of wheelbarrows, carts, chutes and hoists. The conveyor carried the mixed concrete from the paver to the forms and the work was done so rapidly that 6 or 8 men were used for tamping. The whole mixing and paving unit moved along together as the paver was self-propelled and the conveyor had its wheels swiveled and was attached to and trailed by the paver. The floor was first laid with the paver and the reinforcing for the side walls placed and the forms set as this work progressed. Using this combination, the contractor constructed approximately 75 feet of wall per hour requiring about 45 tons of material. The entire 3,400 feet was poured in 32 working days. 19.11.55

Building 136 Concrete Bins



The Completed Grain Storage Annex Showing the Ramp for the Transit-Mix Trucks and the Hopper and Concrete Tower

THE Commission of Public Docks, Portland, Oregon, in the summer of 1930, expended $425,000 on the construction of a grain storage annex for the bulk wheat, at the rail and water shipping Terminal No. 4, on the right bank of the Willamette River. The new structure, which stands alongside the old elevator and storage house, erected about 15 years ago, affords additional storage for 940,000 bushels of wheat.

The building, which required 12,000 cubic yards of concrete, rises to a height of 93 feet above the foundation slab, and has 72 circular bins and 64 interspace bins. Resting upon the top of the bins is the concrete cupola structure, 14 feet high, containing three sets of belt conveyors whereby the grain is delivered to the bins by means of trippers and spouts.

The Pile Footings

The Annex building, which rests upon pile footings, occupies an area of 153 by 135 feet. This space was first enclosed with four rows of pinch piling and a retaining wall, designed to resist possible pressure of ground from without. In these four rows are 809 piles, driven on 2½-foot centers, in staggered position, reaching down to El.-50, or 50 feet below U. S. Engineers' datum at low-water level. These were driven by the Gilpin Construction Co., Portland, as a subcontractor.

The enclosed foundation area was then excavated to a depth of 16 feet, or to the proposed cut-off level of the foundation piles. Within this space there were driven 2,306 fir piles, on 3-foot centers. These are of a length of about 103 feet, with a diameter at the butt of 16 to 18 inches, and close to 9 inches at the opposite end. They were driven through several layers of material, consisting of ordinary river fill, marshy ground, and loose sand. At the lower ends they penetrated a stratum of compact sand to a depth of 14 feet. This part of the job was performed by the Baker Construction Co., a subsidiary of the Hauser Construction Co., Portland, who used two Vulcan No. 0 steam pile-drivers, equipped with 17,000-pound hammers. The pile driving was put through in two months, a high-speed record. The maximum rate of driving was 9,800 linear feet of piles per day.

Concrete Superstructure

The general contract for all concrete construction was awarded to Albertson & Cornell Bros., Tacoma, Wash. This firm, however, collaborated with the Casseday Engineering & Construction Co., Seattle, in handling the job. In fact, C. L. Fargo and F. Van Antwerp, Construction Engineer and Superintendent of Construction, respectively, have formerly been identified with the Casseday company.

The initial work under this contract was the pouring of a reinforced concrete mat, 24 inches thick, over the pile heads—the cut-off level of the piles was at the level of the water table which is 16 feet below the ground surface. The concrete used in the foundation slab was designed for 2,000-pound strength. A 1-yard batch contained 517 pounds of cement, 1,903 pounds of 1½ to ⅛-inch gravel, 1,347 pounds of sand, and about 30 gallons of water. This 24-inch mat, resting upon the pile footings, was heavily reinforced with 1-inch steel rods, variously spaced.

The concrete used for all structural work above the foundation slab was proportioned for 2,500-pound strength, a 1-yard batch comprising 564 pounds of cement, 1,920 pounds of gravel, 1,340 pounds of sand and 30 gallons of water. This class of concrete was for the circular and interspace bins, their supporting piers and the cupola structure. Between the foundation slab and the bin-bottom slabs, there is a vertical distance of 17 feet. The supporting structures of that height consist of square, hollow, mass-concrete piers, with 15-inch walls. The piers were built monolithic with the 10-inch bin-bottom slabs. The piers are so designed as to give

in an Area 153 *by* 135 Feet

The New Grain Storage Annex Built for the Commission of Public Docks, Portland, Oregon, at a Cost of $425,000

By
W. A. Scott

each bin 8 points of support.

The circular bins, which are hopper-bottomed, are 15 feet from center to center with wall thicknesses of 8 to 6½ inches. The hopper fill for each bin is of cinder concrete, which contributes to lightness in weight.

The Cupola Structure

The concrete cupola structure, extending 14 feet above the tops of the bins, is rectangular in form, covering the entire bin area. The cupola floor supports three parallel belt conveyors, about 45 feet apart, and 230 feet long. However, each 230 feet of conveyor line on the cupola floor is a part of a continuous belt conveyor, 575 feet long, that extends entirely across three structures at this level—the grain elevator building, the old

Building the Foundation of the Grain Storage Annex Showing the Pinch Piling Surrounding the Area and the Pouring of the Reinforced Concrete Mat Resting on the Foundation Piles

storage building and the new storage annex. These are 36-inch rubber-covered belts, made by the Pioneer Rubber Mills, San Francisco. Each conveyor unit is driven by a Fairbanks-Morse 25-horsepower motor, the power in each case being transmitted through a Gilmer V-belt.

On each conveyor line is a tripper, by which the grain may be diverted through metal spouts to any of the bins. In this way the three conveyors serve in filling the 72 main bins and the 64 interspace bins. On the basement floor, below the bins, there are three similar conveyors for ship loading, the grain being drawn onto the belts by gravity through the bin spouts.

HANDLING READY-MIXED CONCRETE

Ready-mixed concrete for this job was furnished by Swigert-Hart & Yett, Inc., Portland. The proportions of cement and aggregates were made up by weight at their dock plant, and 3-yard batches were delivered at the job in their transit-mixer trucks, requiring a haul of 2 miles. For pouring the foundation slab, the fresh concrete was discharged from the transit-mixers to a hopper, from which it was passed into distributing buggies. Deliveries for pouring at higher levels required the use of a ramp and hopper. Under this arrangement, the transit-mixer trucks were backed up the ramp and the 3-yard loads of concrete were discharged into the hopper, from which the 1-yard tower skip was filled. The skip loads were elevated and discharged into the distributing carts at rapid speed. There was no spouting of concrete on any part of the job. The use of eight to ten 3-yard transit-mixers was required in supplying ready-mixed concrete.

HIGH SPEED CONSTRUCTION

The construction contract required the pouring of about 12,000 cubic yards of concrete. Pouring was begun on July 27 and the last run was on August 26, 1930. The bin walls were poured in 7 days, which was at the rate of 1,000 cubic yards per day of 24 hours. Putting the speed record of the constructors in another way: the contract was awarded on July 3 and the bins were ready for the storage of grain on August 31, thus winning a 14-day bonus of $1,000 per day. They set up the forms, poured 12,000 cubic yards of concrete and made the necessary installations in 35 days.

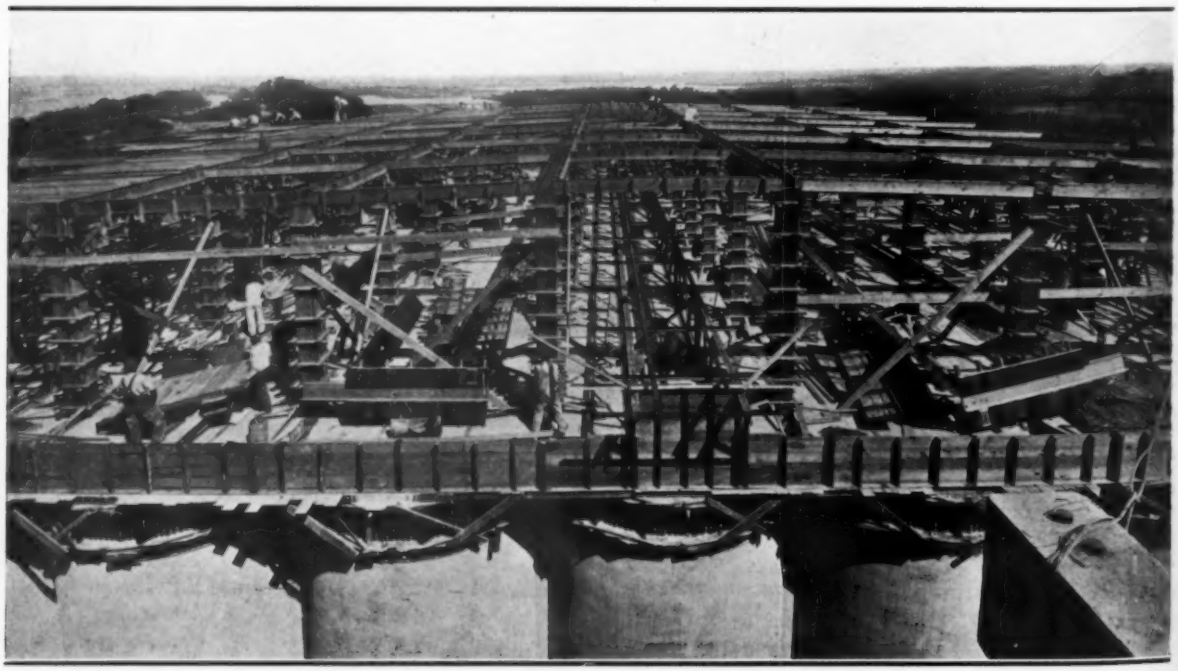
A. D. Merrill, Engineer for the Commission of Public Docks, directed the preparation of the plans, and exercised general supervision of construction. E. F. Carter, Engineer for John F. Metcalf Co., Chicago, acted as Consulting Engineer on plans and construction. Ray Whiting was Field Inspector for Mr. Merrill.

Blowpipe Provides Effective Method of Cutting Reinforcing Rods for Concrete

A VISIT to almost any large city nowadays will reveal buildings in the process of being demolished to make room for new structures. While this work was approached with considerable trepidation in the days before there were specialized wrecking contractors, it is a comparatively simple process today.

Breaking up the concrete is done by the usual means of sledging, drilling and wedging. However, the smaller chunks cling together tenaciously because of the steel reinforcing rods. It is a very simple operation for a workman to cut these rods with the blowpipe, thereby freeing the masses of concrete so that they can be conveniently carted away.

Construction contractors also find the cutting blowpipe a useful tool in connection with steel reinforcing rods. In the construction of a tunnel under a railroad in eastern New York, the rods for use in reinforcing the concrete were delivered in standard lengths, which necessitated cutting the rods to lengths suitable for use. Using rods of the desired lengths as measured the workmen placed them alongside of the rods to be cut, and it was a simple job to proceed from one rod to the next along a line, using a cutting blowpipe. Each ½ or ¾-inch rod was cut in a few seconds, only a fraction of the time formerly required by other methods.



Construction of the Cupola Structure on Top of the New Concrete Bins

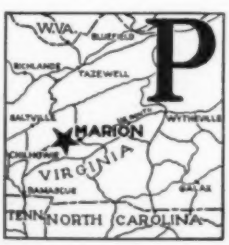
New Grade

Took Kinks Out of Highway

in

Southwestern Virginia

27,000 Yards of Excavation on 1.117-Mile Job With Bituminous Macadam Top



PROCEDURE on Virginia state highways where the top is to be a bituminous macadam makes it possible for practically any dirt-mover to be able to take on a paving contract. The contractor is only required to put down the base course after preparing the subgrade and then the State steps in and with its own labor and equipment completes the bituminous macadam top. This saves the contractor the worry over additional equipment, and has attracted a large number of contractors to the State to handle the many grading contracts now under way and about to be let. The older highways in Virginia, like many other States, are filled with sharp curves and steep grades that might have been all very well for the slow-moving traffic of 25 years ago, but are really dangerous for modern motor traffic. Further, the old paved surfaces are only 14 feet wide in many cases with none too firm shoulders, making passing at the State speed limit of 35 miles an hour truly hazardous.

New Grade on U. S. Route 11

A new right of way cutting off considerable driving distance and numerous curves and eliminating a railroad grade crossing was secured about 3 miles west of Marion, Va., on U. S. Route 11, and a contract was awarded to R. H. Bolling, of Norton, Va., for excavation and surfacing with a base course preparatory to applying the 10-inch bituminous top 18 feet wide by the State. The excavation included a total of 27,000 yards of rock at 59 cents a yard. The fills were made to a width of 40 feet and the cuts to subgrade widths of 40 feet, 2 feet being allowed for ditches. Work was started at the east end with the Lorain-75B shovel and 2 Mack trucks and a Federal.

Rock from One End to the Other

The job had scarcely enough earth excavation to count. The rock varied from a shale and limestone of ordinary hardness to the toughest black limestone with white streaks through it. A ledge of the black limestone, located about 0.6 mile from the west end of the job had 11,000 yards of rock to be removed. The contractor planned to set up a quarry at this point to crush the stone for the base course. The tests at the State Department of Highways laboratory were satisfactory. The contractor set up a 12 x 24-foot Reliance crusher of about 300-yard capacity near the end of the big cut and used the surplus stone on the job, in order to save on the cost of the crushed stone and in addition about 2 or more miles on the hauling. This set-up gave him an average haul for the stone of about 2,000 feet. The contractor's plan for this set-up was to place the crushing plant and bin in the bottom about 500 feet from the center of the heavy cut. The surplus stone from this cut was dumped in the bottom, the larger pieces being capped or dobied there, then after crushing loaded from the bin and trucked to the subgrade.

The contractor had three air compressors on the job, and went at the work of drilling and blasting very methodically, so that the rock was blasted well ahead of the shovel. Two Ingersoll-Rand and one Metalweld Air King compressors were used to operate four Chicago Pneumatic and two I-R jack hammers. One I-R pneumatic sharpener was installed at the middle of the job and handled the sharpening of all the steel except for the stock of detachable bits which were tried out. The

holes ran from 8 to 10 feet deep on an average with the maximum 22 feet.

About 4½ tons of Hercules 60 per cent and du Pont 40 per cent gelatine dynamite were used.

HAULING TO FILLS

All of the excavation was hauled to fill by the trucks or a pair of Troy Ajax dump wagons, which were pulled in tandem by the Caterpillar Thirty. The tractor was also used to bulldoze the material into place and for hauling the Adams leaning wheel grader with a 10-foot blade on the rough grade. At one time after an all-night downpour the earth in the subgrade balled so that the grader had particularly hard going. Virginia mud can be very slippery, and the tractor treads just held in the broken stone that made up 90 per cent of the subgrade.

The fills were rolled in approximately 12-inch layers with a 10-ton Austin steam roller, which was taken off the job and sent to another contract and replaced by an Austin gas roller. The maximum fills were 17 feet deep, requiring a maximum haul of 500 feet and an average haul of about 200 feet on the entire job.

PERSONNEL

W. R. Beverly was Superintendent for R. H. Bolling, who had personal charge of the work. T. J. Rison was Inspector for the State, and E. L. Micou was Resident Engineer.

New Government Contracts Awarded

ON January 26 the U. S. Lighthouse Department awarded a contract to Merritt-Chapman & Scott Corp., 17 Battery Place, New York, N. Y., for $185,000 for the construction of a new Lighthouse Department base at South Portland, Maine, where all activities for the New England District will be concentrated. The contract covers two steel piers, each 250 feet long and 75 feet wide, as well as the dredging of the channel to 16 feet deep at low tide.

The new Merritt-Chapman & Whitney Corp., of Duluth, has just been awarded a $350,000 contract by the U. S. Engineer's Office at Milwaukee, for the rebuilding of the south breakwater at Milwaukee. Work will start as soon as navigation opens and will be completed before it closes next fall. The breakwater is 758 feet long and the work will include the raising of 15 reinforced concrete caissons, containing core rock and weighing 1,024 tons each.

Completing a Fill on the R. H. Bolling Job Near Marion, Va., Showing the Lorain 75-B Shovel, Two Mack Trucks, One Federal Truck, One Troy Wagon and a Caterpillar Thirty Tractor with Bulldozer

The bulking of the stone in the large cut made it possible to revise the fill east of this cut and raise the fill about 4 feet in the deepest part, thereby helping to ease the grade and also take care of surplus material without additional cost to the State.

DRAINAGE STRUCTURES

One corrugated iron culvert 24 inches in diameter and 93 feet long, and five 18-inch culverts of the same material totaling 409 feet were installed. There was also one 6 x 6-foot reinforced concrete box culvert 86 feet long. This culvert takes the drainage of a large area of pasture land above the road, which flows off quickly in heavy rains but runs as a very small stream most of the time.

LABOR

The job employed a total of 15 to 29 men, all white labor, throughout the contract. All of the labor boarded in Marion, nearby, so that a labor camp was not needed.

Engineers and Construction Created World's Greatest Residential Street

THE Park Avenue Association of New York City has recently published under the pen of F. A. Collins an interesting 107-page book "The Romance of Park Avenue," telling the story of this street from early Dutch days. The author tells a striking tale of the creation of the present magnificent residential street purely by engineering design and construction. Neglected until the beginning of the 20th century, Park Avenue in the brief space of 30 years has been transformed from a mediocre highway lined with factories, some dwellings, and many squatters hovels to an outstanding street with magnificent hotels and apartment houses built over one of the largest railroad yards in the country with every precaution having been taken to prevent the vibration of any passenger train being transmitted to the frames of the buildings.

Copies of this book may be secured from the Park Avenue Association, Inc., 342 Madison Avenue, New York, at $2.50 each. The book is well illustrated with reproductions of old prints and photographs showing the development of the avenue.

Driving *a* 2-Mile Water Tunnel *with a* Capacity *of* Nearly One Billion Gallons Daily

Construction of Huge New Power Unit at River Rouge Plant of Ford Motor Company Necessitated a Two-Mile Intake Tunnel Project

FOUR major additions to the River Rouge plant of the Ford Motor Co. at Dearborn, Mich., were required to take care of the immediate and future needs of the main power system. These additions include the installation of two new high pressure boiler units, the placing of a powerful steeple-type turbo-generator, the introduction of turbo-blowers of increased capacity and the building of a water tunnel more than 2 miles long. The entire change-over is being handled without interruption to production. In the aggregate it will represent an expenditure of several million dollars. That energy which will be added by the above construction, plus those already existing, will give this plant a total electrical capacity of approximately 230,000 kilowatts.

Various steam condensing units to be installed will require an added quantity of cooling water. The 120-000-kilowatt turbo-generator alone calls for 150,000 gallons per minute. This, however, is not the primary reason for the building of a water tunnel with a capacity of approximately 1,000,000,000 gallons every 24 hours. The more immediate purpose is to obtain cleaner water at a temperature better suited to efficient condenser cooling and general service than has heretofore been possible.

Present and Prospective Mill Water Requirements

On the southerly side of the plant area runs the River Rouge which winds in a generally eastward direction to empty into the Detroit River. This was originally little more than a sluggish creek with a normal summer temperature of from 75 to 80 degrees Fahrenheit. Subsequently, the stream bed was dredged to a uniform depth of approximately 20 feet for the admittance of large boats from the Detroit River direct to the Rouge plant. Inland at the edge of the plant a turning basis for shipping was provided and leading from this basin and almost perpendicular to the stream's course a boat slip was excavated. This slip is 250 feet wide by a half mile in length. It is from the enclosed or upper end of this slip that water is now being drawn for plant and mill use. From the intake it passes through a tunnel to a screen house. The intake aver-

Tunnel Ring Blocks at One of the Material Plants. A Total of 45,790 of These Units, Having a Combined Weight of More Than 78,000 Tons Were Used in the Tunnel

Front View of One of the Erectors Showing the Manner in Which the Blocks Were Placed in the Construction of the Water Tunnel

ages 567,648,000 gallons every 24 hours. Of this total about 20 per cent is for plant use and 80 per cent goes to the power house. The latter supply passes through a tunnel 12 feet 8 inches in diameter and approximately 5,000 feet long. After passing through the condensers, the water travels through an outlet tunnel or tail race, the mouth of which empties into the Rouge stream a little below the turning basin. On the other hand, water from the steel mill, glass plant, etc., following its use for cooling and flushing, is also returned to the River Rouge, with the result that during summer months the stream temperature rises to between 84 and 87 degrees.

The chief problem now solved with the introduction of the new water tunnel lies in the fact that the entire plant requirement is approximately four times in excess of the total Rouge River flowage. The average flow of the river normally available to the boat slip is 200 feet per second, but, since the amount of water drawn from the upper end of the slip approximates 900 feet per second, it follows that 700 feet of this is had by reversing the current. This results in the creation of a loop composed of an immense quantity of water that is actually used over and over again. The result of this recirculation from the slip into the plant and from the plant back to the stream channel tends to build the temperature of the water to an average of 90 degrees and there have been summer days when it has reached a maximum of 96 degrees.

With the new intake in operation, the intake water will, it is expected, average 71 degrees Fahrenheit for the hottest months, 65 degrees for the next hottest and so range downward to a winter minimum of around 33 degrees. By using the present intake tunnel for the expulsion of used water, both the boat slip and the Rouge River will undergo a continuous flushing and the water be relieved of the turbid condition which now exists.

THE NEW WATER TUNNEL

The tunnel which is to accomplish this end was begun August 15, 1929. Its exact daily capacity will be 913,600,000 gallons, amounting annually to 333,464,000,000 gallons, or over 80,000,000,000 more than is used in a like period by the cities of Detroit, Cincinnati, Washington, D. C., and Philadelphia combined. So far as is known it is the largest tunnel ever built to serve the needs of a single industrial concern.

Generally described, the tunnel is a true cylinder with an inside diameter of 15 feet and an outside diameter of 21 feet. Two thicknesses make up its walls. The outer is composed of interlocking cement blocks, weighing 3,420 pounds each, ten to a ring, the succession of rings set one against the other. These blocks, curved in the moulding process to conform to the arc of a cross section of the tunnel, constitute, in the aggregate, the entire outer tube. The inner lining is also 18 inches thick and is formed of monolithic concrete. The tunnel is 12,000 feet long and is located 60 feet below the surface of the ground. Ten curves are included, the longest covering a distance of 466 feet.

The tunnel begins with an intake located on the old channel of the River Rouge, at a point about two-thirds of a mile from the Detroit River, and ends with a pump well and house located in the lee of the Rouge Plant No. 1 power house. Proceeding from the intake the tunnel's course passes under a dozen streets and main highways, street car and railroad tracks, bridges, city sewers, a creek and a cemetery.

The tunnel was excavated by the shield method, four of these machines working on the job. Each shield was circular in transverse section, 21 feet 6 inches in outside diameter, 14 feet from the cutting edge to the open tail and built of steel with the shell 2¼ inches thick. Stepped back a distance of 3 feet from the cutting edge was a diaphragm placed at right angles to the axis of the shell, itself of heavy ribbed steel plates braced with angles. Six ports, or "pockets" pierced the diaphragm but these were reduced in size to an average of one square foot with the use of cross timbers.

The advancing force was applied by twenty hydraulic jacks so placed around the circumference border of the diaphragm as to push against the ring of concrete blocks last set in place. The jacks had cylinders 10 inches in diameter and were actuated by water carried by a 1½-inch line, at times 3,000 feet long, at an average pressure of 3,700 pounds per square inch. The average pressure exerted by the individual jacks was approximately 156 tons.

Receding from the extreme back of the diaphragm, the steel shell extended a distance of 5 feet. At the completion of each shove this extension overlapped half of the width of the ring of blocks most recently erected. The operators worked within the tail of the shield.

For the greater part of the job the work was in blue clay of the consistency of putty. As the jacks, pushing against the block ring, advanced the shield, the clay oozed through the diaphragm ports much as tooth paste comes from a tube. Two men were stationed at each port. As the clay was forced through, one of them cut off sections of it, weighing from 50 to 100 pounds each, by using a curved length of wire fitted with wooden handles at the ends. The second workman caught and

tossed the severed chunks into electrically-propelled tram cars.

Following the necessary advance, the jacks were withdrawn and the next circle of blocks set in place by an hydraulic erector of the arm and ram type, with the fingers inserted in depressions provided in the concave surfaces. The time required for the erecting of these rings varied, but both the shove and the placing of a ring was often accomplished in 45 minutes. The rate of progress may be indicated by the month of September when working two shifts in each of two headings the distance covered totaled 2,160 feet.

It has been stated that each ring comprises ten blocks, but this must be qualified. For every complete circle contains nine solid blocks and a tenth of equal size but moulded in two parts, and so shaped that the erection of a complete ring of blocks could be accomplished without moving the erector. In the progression of rings the positions of these key blocks were staggered—at every third ring the key was centered, i.e. left, center, right; right, center, left, etc.—which, in turn, made for an alternating lapping or dovetailing of all blocks in opposing rings.

Every block, and this included one each for the split unit, was moulded to include two projections, or kidneys, on one side, and two corresponding recesses on the opposite side. The extensions were of sufficient length to contact solidly with the floor of the recesses in the connecting blocks, and yet, by reason of a slight excess of length, provide enough space, about ½-inch, between the block side-surfaces to eliminate the possibility of beam action. Before applying pressure to the last placed ring of blocks, wooden kidneys were inserted in the block recesses, thereby providing a straightaway line of force to move the shield. Consequently the line of pressure passed backward from kidney to kidney and the strain of the shield advance was borne by them and by no other portion of the blocks.

Counting the key block and its companion unit as one, all blocks measure 6 feet in length, 2 feet 6 inches in width, and 18 inches thick. They were made in material plants located convenient to the job and poured at the rate of 430 every 24 hours. A 1:2:3 mix was required, using portland cement from the Ford Motor Co.'s wet process plant which utilizes furnace slag in production. The sand used was sharp, fine aggregate, and the pebbles, coarse aggregate, both tested at the pit.

After pouring, every block was allowed to set for 12 hours before the forms were removed and the blocks themselves left undisturbed for a period of 18 hours. Through the next seven days they were sprayed with water twelve times every 24 hours, and following that, every four hours for a period of 21 days. After the 28-day curing they were transferred through the shafts to the tunnel floor tram cars. The number of blocks used on the entire job was 45,790, or at the rate of 3.4 cubic yards of concrete per linear foot.

The Inner Lining

The 18-inch thick inner lining of the tunnel is of monolithic concrete throughout. To reduce water friction, all fins and rough spots were removed with electric grinders. The job called for hand placed forms, the complete pouring, both top and bottom, per crew, progressing at an average of 51 feet a day with straight going, and 40 feet on curves. The bottom forms were gravity filled to the spring line from 1-cubic yard cars which were pulled up an incline by an air hoist. The upper forms were filled by hand shoveling. To minimize air pockets, care was taken to see that both sides were brought up uniformly before the final crown section was placed. At 10-foot spacings pipes were placed in the walls for grouting and possible voids filled by forcing a cement mixture through them under an air pressure of 100 pounds.

Holes had been moulded in the concrete blocks when cast with the idea of reaching in and grouting the spaces to provide against beam action. It was found, however, that the exterior end of these holes became so plugged with the putty-like clay forced back over the shield, that this grouting was unnecessary.

Concrete for the interior lining was poured at the rate of 2.88 cubic yards per linear foot, or a total of 33,560 cubic yards for the job. All concrete was tested for compressive strength, with a minimum limit of 2,650 pounds per square inch in the invert of the tunnel, and a minimum strength of 4,000 pounds for the crown.

Water in the mixture was at all times kept under reasonable control by the inundation method. Six gallons of water was used to every bag of cement. When the distance from the mixing plant to the pouring point was excessive, an admixture of diatomaceous earth was used to prevent segregation. This was held to 2 per cent for the longest haul of 3,200 feet.

Starting the Tunnel

The work of locating the course of the tunnel began with the sinking of a chain of test borings at an average of every 200 feet over the tentative route. These bor-

The Junction of Shields Nos. 2 and 3 After the Diaphragms Had Been Burned Away. Note the Perfect Alignment of the Rib Fins. This Feat, Resulting from the Underground Survey Calculations, Is Believed to Be Without Parallel

Illustrating the Perfect Junction of the Cutting Edges of the Rouge Plant Water Tunnel Shields Nos. 2 and 3 Following an Advance of More Than 3,000 Feet Made Without the Aid of Surface Alignment Holes

ings were 6 inches in diameter and were driven through hardpan to a bedrock of Dundee limestone. The borings showed the general character of the ground as well as the amount of sulphur water or gas that might be expected when actual driving was begun. Later, and as an additional check, four test pits, 6 feet in diameter and from 60 to 65 feet deep, were driven at strategic points.

When the route was determined the necessary arrangements were made for tunnelling under highways and for closing streets. Next the two shafts which would provide four working headways were located.

THE SHAFTS AND SHIELDS

The two shafts, driven with sheet piling and floored with a mat of reinforced concrete, were each 25 x 30 feet and 70 feet deep. That portion of the shaft side through which a heading was to be begun resembled a huge gridiron. The frame was formed of two 16-inch H-beams, which braced the top of the opening, and sides of 18-inch beams secured to and resting upon the edge of the shaft floor. Extending from one 18-inch beam to the next and parallel to the top and bottom braces, were seven 14-inch H-beams set on 3-foot centers.

The shield, representing a total weight of 125 tons, was lowered in sections and set up with its front flush against the cross beams. In some places these beams passed, and in consequence, closed the ports in the diaphragm. The first step, then, was to burn through them and the sheet piling with acetylene torches and so remove segments equal to the width of the ports. The next was to cut these same beams and the sheeting over a circular area as dictated by the circumference of the shield. This operation left nothing but the decapitated lengths of the beam stubs, sheet piling fragments, and blue clay ahead of the diaphragm. It was against this combination that it made its first shove and so started the tunnel. In each case a portion of the dismembered beams were pulled out through the ports; but not all of them. Some were still being advanced long after the shafts were left behind, and one piece kept a shield company all the way to the intake end of the job.

It has been previously mentioned that the openings in the shield head were kept to an average of one square foot by the use of cross timbers. This served two ends. When the constant checkings on the part of the engineers showed there was an indication that the earth surface might bulge at some point overhead, the vertical pressure was relieved by enlarging the port openings. If conditions pointed to a surface sinking because the excavated earth was being brought through in too great a quantity, the ports were reduced in size or in number. A tendency in either direction was also handled by a redistribution of the hydraulic jack pressure.

Timbered openings were also effective when now and then boulders were encountered. By removing the false facing those not too large could be made to pass inside. Or, in the event of one of unusual size, the shield could be stopped and the stone broken up. Boulders as large as 3 feet in diameter were split with plug and feather. Considering the distance covered, few stones were met. This was likewise true of sand pockets cut into. The largest of these were perhaps a yard wide and 4 feet high.

DIFFICULTIES AND PROGRESS

At the start the plan was to construct the outer or earth side wall of the tunnel of wood cants, and this construction lined with poured concrete. The cants used were 10 x 10-inch timbers, each 4 feet long. Sixteen pieces were required for the space now served by each of the concrete block rings subsequently decided upon. The canting progressed for some 500 feet before the idea was abandoned. It was given up largely because the wood construction could not offer resistance enough to the pressure brought against it by the jacks. In many instances, during the progress of a shield shove, the cants were severely compressed and this resulted in distortion to the shape of the tunnel. In others the pressure actually kicked cants from their positions. Moreover, quantities of the clay passed over the top of the shield shell and brought a weight upon the ridge of the cant wall sufficient to distort it from above. As a result of these several contributing difficulties the job was shut down for three months. In the interim steel forms were constructed, an initial supply of the concrete blocks, heretofore described, poured and cured, and the work begun on a second and final basis.

As the permanent work proceeded, the exactness of calculations made for many remarkable results. For example, the first heading had extended over a distance of 1,000 feet before the first alignment hole was drilled from the surface into the tunnel bore. Through it a plumb bob was lowered for a correction of the underground line with the surface survey. It was found that the tube, which had been carried on to this point without exterior aid, was off but 5/16-inch from the true line. During the course of construction twelve such align-

ment holes were put down. These were placed at the ends of curves or where the going was hardest, and were invaluable for checking.

The splendid coordination of engineers, workmen and machinery was amply illustrated when both the headings that entered the connecting segment at the intake and the auxiliary tunnel at the well, agreed to within a single inch. But these headings were the first to be completed. There remained the work of joining the two which, progressing from opposite directions, were to meet head on at a point approximately midway of the tunnel. The last advance covered a stretch of 3,200 feet. This entire distance was made without the aid of a surface alignment hole. Yet the two shields met in absolutely perfect contact of circumference. When the diaphragms were burned away it became apparent that every rib fin of each frame continued in exact line with that immediately opposed to it. So far as is known—the distance traveled without alignment holes considered—this feat in engineering is without parallel in tunnel construction.

While the clay encountered varied as to moisture content, practically no water was met with. The only time when this gave anything like serious trouble was when, in sinking steel sheet piling to a depth sufficient to gain a proper toe hold for the No. 2 shaft mat, the hardpan was punctured. The result was an intake of sulphur water at high pressure and which contained a large amount of hydrogen sulphide. Neutralization was effected by dumping a truck load of lime into the 18 feet of water that had risen into the shaft. Pumps were then applied and the puncture in the hardpan sealed.

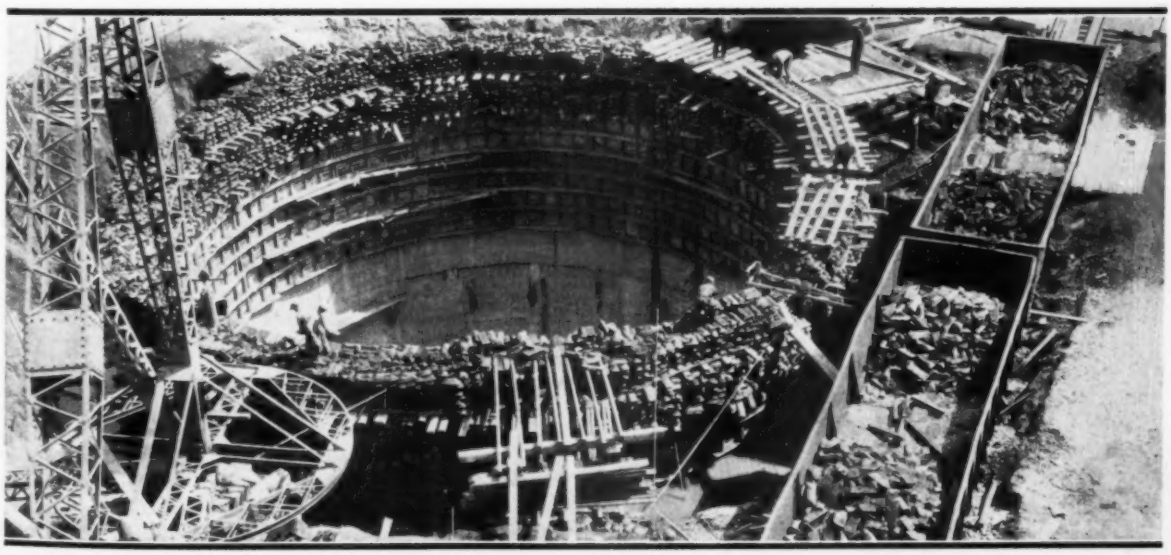
From the information secured from the test hole and test pit data, sulphur and gas warnings were established and closely watched throughout the job. Frequent tests were made for the detection of explosive or poison gases and to make certain that the oxygen content was sufficient. For both winter and summer the tunnel air temperature was close to 58 degrees.

One of the most ticklish conditions that the engineers had to meet was the task of passing under a single area containing a combination of a creek, a large city sewer and a railroad bridge. The piles supporting the bridge and those that had been driven by the company constructing the sewer formed a network on each side of the stream, with the sewer parallel to the creek and the trestle crossing them both at a point where the sewer turned and passed under the stream bed. There was a clearance of but 3 feet between the pilings and the shield. The passage was negotiated by careful checking of ground elevations and tunnel alignment, plus a nice balancing of the clay intake through the shield ports against the possibility of either surface bulging or sinking.

Position of the New Tunnel Intake

In an earlier day the River Rouge took its way toward the Detroit River, but, just before arriving at what seemed its logical destination, described a huge S curve to finally meet the stream around the nose of a peninsula. Subsequently a short channel was cut through the peninsula's neck, making the peninsula an island and that portion of the Rouge which skirted the inland edge of it found its current suddenly reversed. This observation is pertinent because it explains why the water, to be discharged from the Ford plant into the upper Rouge stream under the new mill water set-up, will at no time come in conflict with the intake. Instead it will continue down to join the confluence of the reversed current and so pass through the short cut canal into the Detroit River.

It was because of this condition that a point on that portion of the channel in which the current flows inland was selected by the engineers for the tunnel intake. Work on this job was begun in December, 1929. It started with the building of a cofferdam. This consisted of a sheet piling back wall, 350 feet long and parallel to the harbor line, with the ends of a crescent



When the Cutting Nose on the Lower-Most Ring Had Reached a Depth of 80 *Feet in the Sinking of the Rouge Plant Pump Well, It Struck Hardpan. The Photograph Shows How* 1,200 *Tons of Pig Iron Were Then Distributed Around the Top of the Upper-Most Ring to Test the Strength of This Natural Foundation. The Imposed Weight Was Completely Resisted.*

The Vertical, Eight-Degree Curve Described by the Water Tunnel as Viewed Looking Toward the Discharge Chamber. This Curve Is 160 Feet Long and in That Distance Drops 19 Feet.

shaped wall attached to it at either end. The bow, at its greatest width, was 40 feet. These major walls were held together by diaphragm walls set perpendicular to the back wall, and forming pockets which were filled with clay. Following the excavations made possible by this arrangement, 1,400 piles were driven as supports for the intake and screen house structures. The concrete foundations for the substructure began at a depth of 37 feet below the river level. Except for a raised walk, suggestive of a narrow dock, and which is flush with the harbor line, the work extending back to the façade of the screen house is all underground. Longitudinally, this area is now traversed by sidewalks and that portion of a traveled highway which was temporarily closed to all traffic during the construction of the intake structure.

Beneath the dock-line platform is the intake gate gallery and, still deeper, the intake passages which extend under the street and screen house. The intake unit, thus completely covered, is 54 x 154 feet in area.

The screen house structure is 44 x 104 feet. It is of brick, steel and concrete, floored with tile and contains all controls governing screens, gates, stop logs, pumps, etc. It is served by a 10-ton overhead electric crane and heated by a small boiler stationed in an under floor room.

Back of the screen house, and also below grade level, is the discharge chamber. From a base practically as wide as the screen house is long, it swings gradually to the left, always narrowing, to finally resolve itself into the transition chamber which connects with the main tunnel.

The elevation of the water at the harbor line is approximately 94 feet above datum. The stream contiguous with the intake is now being dredged and upon the completion of this work will afford a basin 350 feet long by 180 feet wide. This will supply a maximum stream depth of 35 feet. The bottom of the intake gates will then be around 32 feet below the level of the river.

Railway Construction Progressing Rapidly to Hoover Dam

TRACK layers are following grading crews near Las Vegas, pushing to completion the 22.71 miles of railroad from Boulder Junction, a few miles south of Las Vegas, eastward to Boulder City, the metropolis, which will be the center of attraction for the construction world for the next few years. The first section of the line, a branch of the Union Pacific, was completed January 31. From Boulder City an additional 7.17 miles of Government railroad will extend to the dam site in the Black Canyon of the Colorado. This will be built at an estimated cost of $1,600,000, while $900,000 will be spent on the 22-mile stretch.

As the railroad crosses a barren, desolate country, the line will be protected by dikes against early spring floods and sudden storms. Preparation of the roadbed involved the excavation of 375,000 cubic yards of earth and rock, the construction of 42 bridges and 66 culverts.

When work was first started on the rail project, the contractor encountered an unforeseen obstacle in the freezing of radiators on trucks and tractors in early morning hours.

As another preliminary to the actual construction of Boulder City and the Hoover Dam, the Southern Sierras Power Co. has begun work on a power line to the dam site which will represent an investment of $1,500,000 and more than 200 workmen will be employed. The line will extend from San Bernardino, Calif., over the San Bernardino Mountains to Victorville and from thence in an almost direct line to the Black Canyon. The power line will probably be completed before bids are opened for the dam project on March 4.

Clearing the Right-of-Way for New Highway Will Give Unemployed Work

CLEARING a 32-mile stretch of right-of-way for a proposed relocation of Minnesota trunk highway No. 1 in Cook County, was started by the Minnesota Highway Department in December as a means of relieving an acute unemployment situation among the fishermen and settlers on the north shore of Lake Superior. Although right-of-way for the new road was acquired last summer, the department had not intended grading it for two or three years. Due to circumstances which left a great many of the settlers without means of support, however, the department decided to do the clearing by day labor during this winter. Only local residents are being employed.

The stretch of road to be cleared runs from Cross River to Grand Marais. Ordinarily clearing is included in the grading contract, but in this case the grading will be let at some future date when funds are available. A State highway engineer has been sent to Grand Marais to supervise the job. The allotment for the clearing is $16,000. This trunk highway is now paved to Two Harbors and graded and bituminous-treated from there to Cross River. From Cross River to Grand Marais, an old county road has been used as a temporary trunk highway, but the increase in traffic has made it inadequate. Work was started on clearing in the middle of December and will continue until Spring.

This is an excellent example of the type of work which can be undertaken by states, counties and municipalities in which the employment of hand labor is a reasonable factor in relieving the unemployment situation. In many instances suggestions have been made that machines be discarded and all work be done by hand labor. This would be setting back many years the advances which have been made in construction. Furthermore, if all construction equipment is discarded in favor of hand labor, a situation would develop where there would be a vast closing of factories, machine shops, and allied industries which produce the machines necessary for construction and which in themselves employ hundreds of thousands of skilled and unskilled laborers.

Not Shoot *to* Kill

But Shot *to* Place

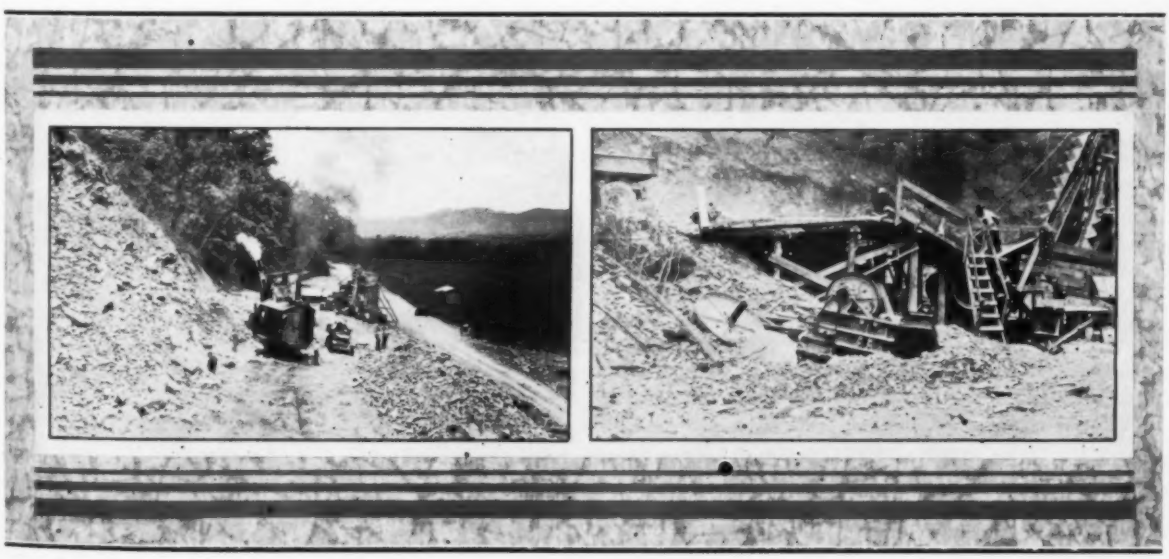
Well-Drill Holes in Roadside Quarry Successfully Loaded and Shot to Land Toe of Shot 70 Feet from Face

SUCCESSFUL shooting of the quarry to provide stone for the 21.78 miles of 16-foot stone base for projects 149-BC and 152-BC between Huttonsville and Mace, W. Va., was only one of the interesting features of the job. A breakdown of the crusher was handled so promptly that only one and a half days were lost. The work was done by the F. C. Sammons Co., Huntington, W. Va., and was started in July, 1929, and completed in November, 1930. The stone base was laid 5 and 8 inches thick according to the nature of the subgrade and stone from 4 inches down to 1¼ inches was used. The final operation was the filling of the base with ¾-inch stone swept into the interstices and rolling.

Well-Hole Blasting Throughout

The first quarry was located 2 miles south of Valley Head on the Mace-Huttonsville road and the second, which was much better stone and worked far better, was about 4 miles south of Huttonsville. The same equipment was used at the two quarries except that there were two crushers, the crusher from the first quarry being transferred to the upper quarry when the crankshaft of the second broke.

The second quarry had from 6 inches to 4½ feet of overburden which was stripped by hand. A Sanderson-Cyclone well-hole drill was used to drill the holes for blasting far ahead of the actual needs of the road crew. Thus the drill was released early in June while the actual placing of the rock was not completed until late August. The lines of holes were drilled in series about



General View of No. 2 Quarry of F. C. Sammons Co. About 4 Miles from Huttonsville, West Va., and a Close-up of the Chute into Which Trucks Dumped Stone from the Quarry for Crushing. In the Left Hand Photograph Note the Small Amount of Stone on the Right of the Road in Spite of the Very Heavy Shots in the Quarry

The Waukesha Motor Located Beneath the Stone Bins Which Supplied Power for the 36 x 18 Universal Crusher

17 feet apart and in rows successively 20 feet back from the face. For minor drilling and for the last of the work two I-R jack hammers operated from a Chicago Pneumatic portable compressor were used. Block-holing was resorted to quite frequently, there being as many as six blasts a day for this work while the blast holes were shot about once a month. The blast holes were drilled as deep as 70 feet, and the jack hammer holes, 14 feet.

THE QUARRY CREW

In addition to the two drillers, the quarry crew consisted of six to eight sledge men, a shovel crew of three men, operator, fireman and pit man for the Osgood steam crawler shovel, three truck drivers for the one Chevrolet truck with hand hoist and the two Indiana trucks with Wood underbody hoists which shuttled from the shovel to the crusher chute. There were two feeders for the 36 x 18-inch Cedar Rapids Universal crusher, one bin man and a blacksmith for the drill steel and a foreman mechanic.

The entire crushing plant, including the bucket elevators and screens, was run by a Model JL 90-horsepower Waukesha motor. The chute to the crusher was covered with a metal plate to save wear of the wood and the feeders were protected by a heavy wooden wall in front of them and a heavy handrail in back of them. All of the ladders about the plant were of heavy, solid construction to prevent accidents.

At the crushing plant was a complete shop for handling all the usual repairs to motor trucks and garage supplies such as grease and oil. The entire outfit had an hour for lunch but about fifteen minutes before the end of the lunch hour, the men went over their trucks and the entire mechanical equipment of the company, greasing and oiling, to be sure that everything was in readiness for the afternoon work.

WELL-PLACED QUARRY SHOT

The quarry at the second set-up was on the west side of the road and was leased. A narrow area of land was also leased on the opposite side so that a road could be maintained for through traffic if the quarry shots blocked the highway. One of the finest and most interesting shots in the quarry was made on June 10. A series of three holes spaced 17 feet apart and located about 100 feet from the center line of the road had been drilled to depths of 70 and 57 feet.

The holes were loaded with a total of 1,250 pounds of 40 per cent du Pont Red Cross dynamite and shot at one time. The loading was so well planned that only three rocks, each weighing about 35 pounds, landed on the road and the toe of the shot fell within 70 feet of the face of the quarry.

A Lorain 75 gas shovel loading to two 3-yard Indiana trucks handled the rough grading where there was need of heavy excavation. Usually two laborers were used for hand work in this operation. The same outfit also handled dressing up the slopes that were too steep.

HAULING TO THE ROAD

A fleet of eight Indiana trucks hauling 2 yards to the load on dual pneumatic Kelly-Springfield tires handled the stone from the four bins at the crusher. The bins held ¾, 1¼, 4-inch and oversize. The oversize was hauled around to the crusher and run through again. As there was a streak of shale in this quarry, the use of which was forbidden by the State, two of the sledgers were used at times when the shale was running in the shots, to pick out the shale as the shuttle trucks backed to the crusher.

PREPARING THE GRADE

A Caterpillar Sixty was used to pull a Killefer rooter or a Galion No. 12 grader to break up the old grade where it was high or to spread the earth to low spots as required. Wood gage blocks were set at grade along the sides of the road to indicate to the spreaders the required depth of stone to be dumped. The trucks spread from the tailboard without the use of spreader boxes because of the size of the stone used. The stone was smoothed off with an Adams No. 4 grader and rolled by two Buffalo-Springfield 10-ton gas rollers.

The road crew consisted of two roller men, one teamster, seventeen laborers and a foreman. Both forks and shovels were used to spread the stone by hand, assisted by the horse-drawn grader. A total of about 160 cubic yards or 200 tons of stone was crushed and packed on the road per 10-hour day. This amount was increased as the haul from the crusher decreased, the figure given being the average.

WHEN THE CRUSHER BROKE

The old crusher at the second quarry set-up suffered a broken 5-inch crankshaft at 9 A. M., Wednesday, June 3. It was necessary to tear out the chute and metal sheeting and the hoppers, and remove the old crusher and frame. In the meantime a crew of men was sent to Valley Head, a distance of 15 miles, where the other crusher, a Universal, was located, to load the 10-ton machine on a 3-ton Indiana truck with dual Kelly-Springfield pneumatics. The crusher was hauled over the rough road, skidded into place and the plant was running again Friday morning at 8 o'clock.

PERSONNEL

The work of the F. C. Sammons Co. on these projects was directed by E. R. Sammons as Superintendent. For the State Road Commission of West Virginia, P. A. Feather was Inspector in charge.

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Flow Reversed in Trunk Sewers and Pollution of Stream Abated

Office of Henry W. Taylor Reports Work at Rome, N. Y.

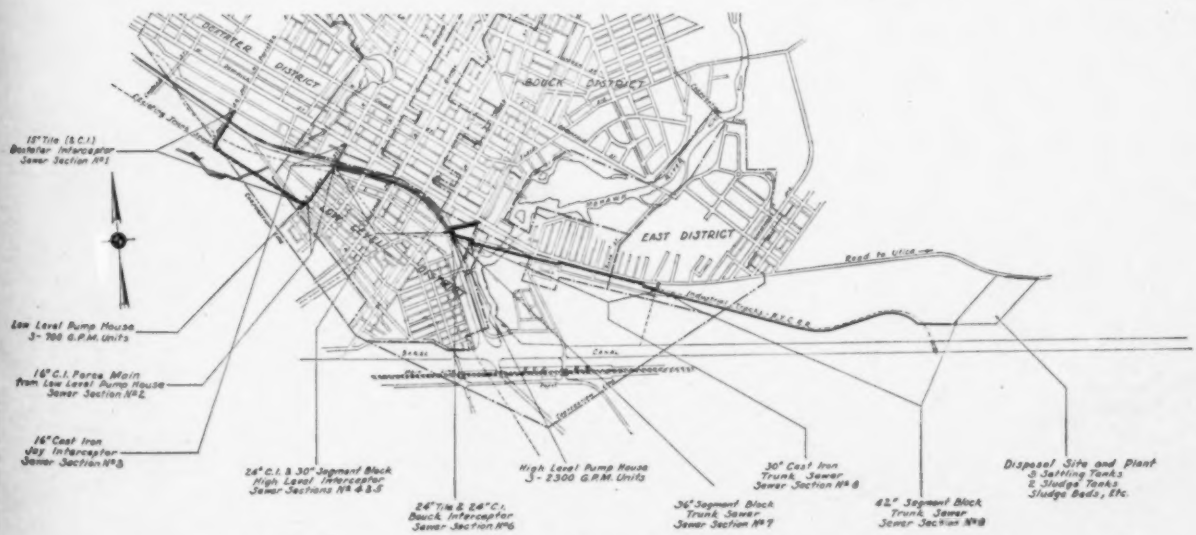
CONTRACT has been let for the Sewerage Development Project at Rome, New York, and the work will be carried on in accordance with plans and specifications and under the supervision of the office of HENRY W. TAYLOR, Consulting Engineer, 11 Park Place, New York.

The sewerage situation in Rome has for years been a problem much discussed but left unsolved for the last 20 years. A separate sewer system was installed in Rome about 1905 and the trunk sewer flowed west and discharged into a small stream known as Wood Creek. With the present population of the city, which is about 29,000, the flow of sewage, during dry weather flows of Wood Creek, is about equal to the stream flow with a resulting dilution of one to one for a crude sewage discharge in a stream which provides less than one second-foot per thousand of population. The resulting situation need not be described and the City of Rome has been paying about $15,000 damages per year to riparian owners on Wood Creek.

Plans have been prepared at different times since 1906 to supply various degrees of purification for the raw sewage so as to eliminate the major nuisance resulting at the point of discharge. Due to the low flows of an unregulated stream with a small water shed, the degree of purification involved a very considerable expense which seemed too heavy a burden.

In 1930 the matter was studied by Mr. Taylor from another angle. It happens that the dividing line between the Wood Creek shed and the Mohawk River shed extends through the center of the City of Rome. The Mohawk River takes a sharp turn northward at Rome and the State has developed north of the City a large regulating reservoir for the benefit of the Barge Canal. There is then, available to the west of Rome, a very limited water shed without regulation into which sewage could be discharged and which would require

(Continued on page 82)


DUTCHER DISTRICT
BOUCK DISTRICT
EAST DISTRICT
Erie Canal
Mohawk River
Road to Utica
18" Tile (S.C.) Dutcher Interceptor Sewer Section No 1
Low Level Pump House 3- 700 G.P.M. Units
16" C.I. Force Main from Low Level Pump House Sewer Section No 2
16" Cast Iron Jay Interceptor Sewer Section No 3
24" C.I. & 30" Segment Block High Level Interceptor Sewer Sections No 4 & 5
24" Tile & 24" C.I. Bouck Interceptor Sewer Section No 6
High Level Pump House 3- 2300 G.P.M. Units
30" Cast Iron Trunk Sewer Sewer Section No 8
36" Segment Block Trunk Sewer Sewer Section No 7
42" Segment Block Trunk Sewer Sewer Section No 8
Disposal Site and Plant 8 Settling Tanks 2 Sludge Tanks Sludge Beds, Etc.

Map Showing Features of the New Sewerage Development at Rome, New York

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Contents

Frederick O. Anderegg, Pittsburgh, Pa. 80
Barlow Engineering Co., Dallas, Texas 82
J. Paul Blundon, Keyser, West Va. 80
Chicago Testing Laboratory, Inc., Chicago, Ill. 81
E. G. Eggert, Austin, Texas 80
Hollard, Ackerman & Holland, Ann Arbor, Mich. 81
Charles H. Hurd, Indianapolis, Ind. 80
Kinsey Engineering Co., Pekin, Ill. 82
Matthews & Kenan, San Antonio, Texas 80
McNamara & Nosky, North Platte, Nebr. 81
H. G. Olmsted, El Paso, Texas 80
Russell & Axon, St. Louis, Mo. 80
L. Segoe, Cincinnati, Ohio 80
William A. Smith, Tuckahoe, N. Y. 81
Henry W. Taylor, New York, N. Y. 79

Former State Engineer Opens Office

AN announcement has been received from E. G. EGGERT, who for the past twelve years has held the position of Assistant Sanitary Engineer of the Texas State Department of Health, that he has resigned from that position for the purpose of entertaining private practice with headquarters in Austin, Texas. While Mr. Eggert has become associated with a number of engineers and municipalities in the capacity of consultant in the water supply and sewage disposal field, he will also be able to serve cities and towns desiring part time sanitary inspection by a trained man.

Mr. Eggert will for the present continue his association with the Texas Section of the Southwest Water Works Association by assisting with their short schools, as well as the Texas Association of Sanitarians.

Consulting Briefs

Charles H. Hurd, 518 No. Delaware St., Indianapolis, Ind., is carrying on an investigation and preparing a report for a sanitary intercepting sewer system and sewage treatment works for the City of Richmond, Ind., a sanitary survey with plans and specifications for connecting sewers and a sewage treatment plant for Danville, Ind., and recently completed a sewage treatment plant with outfall sewers for the City of Rochester, Ind.

Russell & Axon, Consulting Engineers, 6200 Easton Ave., St. Louis, Mo., are engaged in the preparation of plans for a combined sewer system, covering 2,500 acres, for Wellston, St. Louis County, Mo.; municipal power plants for Vinita and Moberly, Mo.; additions to the water works, Columbia, Ill., and paving for Troy, Mo. This firm is also supervising the construction of a sanitary sewer system and disposal plant for De Soto, Mo., and a municipal power plant for Campbell, Mo.

J. Paul Blundon, Keyser, W. Va., is preparing an estimate of cost for the extension for a water line up Scotts Run, Morgantown, Monongalia County, W. Va., involving 5 miles of 8-inch line, and for Firmen's Hall, Ridgeley, W. Va. as well as a preliminary report for a new water supply at Frostburg, Md. The construction of a rapid sand filtration plant, steel reservoir and distribution system for Richville, W. Va., and a sanitary sewer system, Paden City, W. Va., is going on under Mr. Blundon's supervision. Mr. Blundon recently appeared as expert witness is the Glenville, W. Va., rate case, representing the West Virginia Utilities Co.

L. Segoe, 35 East Seventh St., Cincinnati, O., presented a paper "Coordination of Local and Through Routes in Cities' before the Street and Highway Traffic Section of the 19th Annual Safety Congress at Pittsburgh, Pa. He is now preparing city plans and zoning ordinances for Lexington, Ky., Covington, Ky., Middleton, Ohio, and a plan for a Civic Center for Dayton, Ohio, as well as a comprehensive regional plan for Hamilton County, Ohio.

Matthews & Kenan, 16th Floor, Smith-Young Tower, San Antonio, Texas, are preparing plans for several local buildings and seven bridges out of the State of Texas. This firm is also supervising the construction of bridges across Elkhorn River near Hooper, Nebr.; across Platte River near Fremont, Nebr.; across Blue River near Beatrice, Nebr.; across Little Blue River near Hollenberg, Kans.; across Cimarron River near Gate, Okla.; across Beaver River near Gate, Okla.; across South Canadian River near Borger, Texas, and across Red River near Gainesville, Texas.

Frederick O. Anderegg, formerly Associate Professor of Physical Chemistry at Purdue University and more recently senior industrial fellow at the Mellon Institute of Industrial Research in charge of investigations of portland cement and masonry, has announced the opening of a consulting practice on building materials, including portland cement, cement products and masonry at 206 Fulton Building, Pittsburgh, Pa.

H. G. Olmsted, El Paso, Texas, is preparing plans for complete sanitary sewer systems for Aztec and Farmington, N. M. A street paving program and the installation of a sanitary sewer system for Goliad, Texas, are being carried on under Mr. Olmsted's direction. Plans and specifications are also being prepared for street paving and improvements to the water works system for Odem, Texas.

Town Development and Subdivision Plans Under Way by New York Consultant

WORK now under way in the office of WILLIAM A. SMITH, 107 Lake Ave., Tuckahoe, N. Y. and 17 East Main St., Mt. Kisco, N. Y., includes the preparation of a topographical map of the Town of Eastchester for use in preparing a master plan, plans for several sections of the village subdivision of Lawrence Farms at Mt. Kisco, N. Y., a town site development in Duchess County, N. Y., at Lake Secor and also at Camp Sunnybrook, tax map revisions for the Town of Eastchester, N. Y., surveys at Hastings, N. Y., for new public parks and station parking space and the preparation of subdivision and development plans for improving the old Whitehouse property at Irvington and Ridge Acres in Scarsdale, N. Y.

Wm. A. Smith

The construction of reinforced concrete paving on Pondfield Road, Bronxville, Sagamore Road and Fisher Avenue, Tuckahoe, and of bituminous macadam paving on Oakland Avenue, Tuckahoe, was done under Mr. Smith's supervision. Mr. Smith also recently completed the construction of the new detraining spaces at Bronxville, Tuckahoe, and Crestwood, N. Y., as well as the construction of a $250,000 drain through the thickly settled portion of the Town of Eastchester.

Some of the recent subdivisions planned and developed by this office are Hartsdale Acres in Greenburgh, N. Y., Saxon Woods at White Plains, Lawrence Farms at Mt. Kisco, Hartsdale Fells at Hartsdale, Lawrence Park at Bronxville and subdivision and docks for the Secor Realty Co., along the Eastchester Creek at Pelham, N. Y.

Various Power Plant Projects Under Way

PLANS now being prepared in the office of HOLLAND, ACKERMAN & HOLLAND, Consulting Engineers, 106 East Liberty St., Ann Arbor, Mich., and 20 North Wacker Drive, Chicago, Ill., include hydro-electric development for the Spring River Plant No. 2, of 14-foot head, 550-kva capacity, near Mammouth Springs, Ark., for the Arkansas-Missouri Power Co., of Blytheville, Ark.; Spring River Plant No. 4, of 30-foot head, 2,250-kva capacity, near Mammouth Springs for the same company and Sturgeon River Plant, of 55-foot head, 3,000-kva capacity, near Baraga, Mich., for the Baraga County Light & Power Co.

This company is also supervising the construction of the Victoria Plant on the Ontonagon River near Rockland, Mich., for the Copper District Power Co., Ontonagon, Mich. This project includes a multiple arch dam, 125 feet high, 6,000 feet of 1-foot diameter wood stave pipe line and will be of 15,000-kva capacity at 225-foot head. The West Bend, Wis., plant, of 225-kva capacity at a 10-foot head, on the Milwaukee River for the Wisconsin Public Utility Co., and the Municipal Plant at Portland, Mich., of 12-foot head, 475-kva capacity, are being constructed under this company's supervision.

Holland, Ackerman & Holland is a partnership of Ray K. Holland, of Ann Arbor, Mich., and George E. Ackerman, of Chicago. Hugo L. Stanger, Registered Architect, recently joined the staff.

The Chicago Testing Laboratory, Inc.

FOR more than 20 years, the CHICAGO PAVING LABORATORY, INC., 536 Lake Shore Drive, Chicago, Ill., has been in business, with Hugh W. Skidmore and Gene Abson as directors. For many years this organization has been frequently addressed and referred to as the CHICAGO TESTING LABORATORY. For this reason, in addition to recognizing that the older name fails to fully describe the extent of its services, they have decided to use the broader firm name which will be maintained in company with the older one. One institution under the dual name with the same directors, officers, personnel, equipment and location now offers its services which include consultation, investigation, report, specifications, design, physical and chemical testing, research, concrete and bituminous technology, laboratory plant and job inspection of pavements, structures and work, materials, processes and products and petroleum technology.

Competition for Best Design of a Steel Bridge

PRIZES aggregating $1,700 are being offered by the American Institute of Steel Construction for the best design of a steel bridge. There will be two competitions, each having a first prize of $500, a second of $250 and a third of $100, one going to engineering students and the other to architectural students. The first will be judged by a national jury of engineers and architects and is open to any engineering student attending a school or college in the United States or Canada. The second will be held through the Beaux Arts Institute of Design.

The problem is a monumental bridge of restrained simplicity, such as would be erected over a navigable river within the corporate limits of a city of approximately 150,000 inhabitants. It should be 80 feet wide, including two sidewalks of 10 feet each and a total length of 1,770 feet. The approaches for a distance of 165 feet would represent retaining walls and abutments. Night illumination should be provided for.

Diversified Projects Under Way by Nebraska Engineers

WORK now being carried on in the office of MCNAMARA & NOSKY, 517½ Dewey St., North Platte, Nebr., includes the preparation of plans for an athletic field for the North Platte High School; a swimming pool and a paving project for Ogallala, Nebr.; a drainage project for Dauson County and an irrigation project for Buffalo County, Nebraska.

The construction of the drainage project for Dauson County, as well as a similar project for Lincoln County, air mail field and runways for North Platte and a paving project for Gothenburg, Nebr., are being carried on under the supervision of this company. They also were recently called as expert witnesses in drainage and irrigation law suits for Dauson County, Nebr.

Sewerage and Paving Projects for Illinois Cities

A NUMBER of projects of various kinds are under way in the office of the KINSEY ENGINEERING Co., Marshall Block, Pekin, Ill. A report is being prepared on outfall sewers for the Whipple Creek area and for the Fourth Street sewers, as well as a new sewer system for the south side of the City of Quincy, Ill., at an estimated cost of $600,000. The contract has been let for Sewer District A for the east side of the City of Collinsville, the project to include sewers and a sewage disposal plant consisting of a two-story settling and sludge digestion tank and pumping equipment, the estimated cost of which is $105,000. Plans have been completed for the west side sewer district, known as Sewer District B, for Collinsville, which will include sewers, a pumping station and a disposal plant. The plant will consist of a two-story sewage settling and sludge digestion tank, sludge drying bed and sprinkling filters, to cost about $265,000.

This company is also making an investigation for the City of Macomb of a sewage disposal plant for their sewer system. They have under way three paving projects in Macomb and four paving projects in Collinsville, and have just completed the Velde Drainage project at Greenview, Ill., which is to drain overflow land along Salt Creek.

They are also preparing a report on an outlet project for Indian Creek Drainage District and Mud Creek Drainage District.

Design Tables for Using Douglas Fir

THE West Coast Lumber Men's Association, 364 Stuart Building, Seattle, Wash., has published a new "Douglas Fir Use Book" which contains a great deal of useful information for engineers who are planning to use this sturdy wood structurally.

The book contains 203 pages with many tables, diagrams, and explanatory texts. It may be secured from the Association at $1.00 per copy.

Projects in the Southwest

AMONG the plans now being prepared in the office of the BARLOW ENGINEERING Co., 830 Wilson Bldg., Dallas, Texas, are those for 12 miles of railroad from McPhee to Ferris Canyon, Colo., 200 miles of gas line from the New Mexico field to Arizona points, street paving for McCamey, Texas and a water and sewer system for Sierra Blanca, Texas. Work on the street paving for McCamey and the construction of the water works at Sierra Blanca are being carried on under this firm's supervision.

L. B. Caruthers and Fred F. Yockstick, M. E., have recently joined the staff of the Barlow Engineering Co.

Flow Reversed in Trunk Sewers

(Continued from page 79)

a high degree of purification to avoid nuisance and protect the bathing beaches of Oneida Lake, while on the east there is a stream with a regulated minimum flow of about 190 second-feet. It was considered that the eastern alternative provided opportunities for a more successful and inexpensive project inasmuch as the flow to the east provides, for the present at least, 6 second-feet per thousand of population and preliminary treatment only would be required to prevent formation of sludge banks that would interfere with barge canal navigation.

This complete change of plan involved a reversal of trunk sewer flow, which in ordinary cases would prove an expensive and complicated matter. However, in the case of Rome, the bed of the abandoned Erie Canal, now owned by the City, was available for the location of a high level intercepting sewer from sewer district trunk lines and this installation could be made without disturbing the pavement or other types of existing improvements and with great economy. Seventy-five per cent of the city sewage will be intercepted by this new sewer in the Erie Canal and will be lifted about 10 feet to avoid excessive cuts. The main trunk sewer extends along the right of way of the industrial tracks of the New York Central Railroad for about 12,000 feet to a sewage disposal site remote from possible residential development.

The old section of the city which is on a low level and contributes about 25 per cent of the total sewage flow of the city is collected in the old trunk sewer and intercepted by a pumping station which lifts this sewage to the intercepting sewer in the bed of the Canal.

The intercepting sewers consist of tile, concrete, and cast iron pipe, while the main trunk line consists of concrete and segment block, the latter being 42 inches in diameter. The two pumping stations will be of automatic design with relay circuits which will close hydraulically-operated discharge valves before the motors are thrown off the line by float relay circuits. The disposal plant consists of shallow, preliminary settling tanks, in three units. These tanks will be equipped with Link-Belt sludge collectors. A heated sludge digestion tank with fixed cover and an unheated sludge storage tank with floating cover provide sludge treatment. The plant also includes a subdivided sludge bed area and a submerged outfall sewer to the barge canal.

Bids for the work were received in December and the main contract was let about the first of January to Antonio DiMarco for about $207,000, while the equipment contract, which is being readvertised, plus land and engineering costs and margin will make up the remainder of the $300,000 appropriation. The contract was let on a basis of a time limit with bonus and to avoid penalty the work must be completed prior to November 8, 1931. The contract provided for an optional shut-down period at the request of the contractor, not to exceed a continuous period of two months. The contractor has taken his option at the beginning of the work and will start active operations about the first of March.

The project plans for this development were first taken up with the State Department of Health and Department of Public Works of New York State, and their preliminary approval obtained. After the working drawings had been prepared, these departments again passed on the project, and the office of Metcalf & Eddy of Boston made a complete review of Mr. Taylor's project and details and estimates before the work was put out for bidding. An old problem has been solved on an economic and common sense basis and the appropriation of $300,000 represents a saving of about $500,000 when compared with estimates recently submitted for other methods of handling the matter.

The Editor Comments —

Team Work on the Job— What Is It Worth in Cash?

The other evening in discussing the real money value of team work with a group of contractors, the question was raised as to whether a contractor really does get more out of his organization because they enjoy working and pulling together. The consensus of opinion was that even if the contractor did not add one per cent to his actual profits, that the very fact that the whole organization enjoyed its work would be well worth any additional effort which might have been necessary on the part of the contractor and his superintendent in creating a better spirit in the organization which would make itself shown in more team work.

In thinking over this discussion, I recalled a job which I visited a little over a year ago in New Hampshire where even the truck drivers had a friendly rivalry to try to get in an extra load of material. The shovel operator in the gravel pit finished his lunch ahead of time and then, instead of loafing around waiting for the end of the lunch hour, he took a shovel and cleared up a space in front of the shovel so that it would be clear for the crawlers when he needed to move nearer the bank an hour or two later. All of the equipment was well cared for. Every piece of machinery was well oiled to prevent dirt and concrete from sticking to the metal and speeding the depreciation of the machine. During the noon hour, and every one of this contractor's men had a full sixty minutes for lunch, each piece of machinery was gone over to see if there were any adjustments needed to insure full production during the afternoon. This contractor felt that the long noon hour gave every man a chance to really rest and to be ready for the afternoon fresh and free from fatigue. This organization was able to complete the pouring of concrete on two jobs 7½ miles long in 59 working days, making it possible to take on a third job and clean it up before freezing weather began.

Does a happy crew and team work pay? Yes, it pays dividends both in satisfaction and cash.

Monuments for Contractors— Living Not Dead Ones

Bob Davis, world-wide traveler and famed raconteur, in his column in the *New York Sun*, "Bob Davis Recalls" recently reported some interesting paragraphs on his travels in Germany where, in Bamberg, which lies on two sides of the Regnitz River, he noted that the Municipal House is built upon a sturdy causeway that has long resisted the waters pressing against the pillars. He remarks, "Evidently the citizens are proud of the construction, as they call attention to its permanence through a signboard which makes the announcement: 'This Bridge was Renovated in 1538.' The declaration is calculated to send an American contractor to bed for a period of thirty days and people his dreams with nightmares."

Bob Davis apparently has in mind a generation of contractors which died out many years ago. There are plenty of contractors in the United States who build with heart and soul, as well as sinew. As just one example, take Dan D'Onfro and his job on the Mohawk Trail in 1929. He built with speed to specifications plus, and this fine road is a monument to his integrity and skill.

The present-day American road builder is not an individual who delights in skinning the job, like the reputed early New York subway contractors who missed putting in every third bag of cement—when the inspectors was enjoying a glass at the nearby corner saloon. Today you see signs along our highways "This highway built by ———, contractor." Let us build always that we may be advertised by these words. It may be well for a contractor to put his name to every job as the artist signs his pictures. This is the very foundation of Contractors and Engineers Monthly. Into every issue goes full value of practical, usable ideas which have worked on construction projects. Every issue contains concisely prepared descriptions of new equipment. Combining these, the diligent reader is able to check up his own methods and equipment and to be ready to improve each, as necessary.

A Book Worth Studying— If You Think You're Normal

As a purely personal suggestion, I would like to have every contractor and every engineer read and study the book "About Ourselves" by H. A. Overstreet. This book has been my constant companion for nearly six weeks. It has been read and some portions pondered over four times or more. It is an easily understandable book on psychology for normal people that will make you look at yourself with less smug satisfaction and look at your fellow worker or neighbor not as "a little off" or "a freak" but as an interesting problem that can be solved in part by your helpful attitude toward him. And "helpful" does not mean a concilatory or aggressive manner, but the proper attitude that will help him to be less of a "depressive" or "contractive."

If you enjoy studying human nature, including your own particular breed of it, here is a chance to improve yourself and to help others.

Theodore Reed Kendall

Hauling Materials *Under* Adverse Conditions

Data from Several Jobs Using Trucks and Truck Tractors

ON a 3-mile stretch of concrete road east of Pitcairn, Pa., which will ultimately be a part of Lincoln Highway, R. H. Cunningham & Sons Co., Turtle Creek, Pa., had a particularly nasty job during a typical spring thaw early in 1930. Ordinary motor trucks handled the work satisfactorily as long as the ground remained hard, but were unable to carry on when a February thaw turned a sandy borrow pit into a sea of mud.

The truck tractors were used to haul the sandy clay, weighing 2,800 pounds per cubic yard, from a 400-foot pit to a 50,000-yard fill about 1,000 feet long. The tractors were loaded at the pit by a ¾-yard power shovel and run forward out of the pit, across a section of the completed highway and over the tracks of a suburban electric line which parallels the road. They turned sharply after crossing the tracks, at a point about 300 feet from the shovel, and ran up the partially completed fill in reverse for an average of about 500 feet with a 2½ per cent grade against the load all the way. After spotting and dumping their loads, the tractors ran forward all the way to the pit, turned near the shovel and backed up to it for reloading.

During the period from February 12 to February 18, 1930, when an intensive study was made of this operation, 6.0 yards or 8.4 tons per trip were handled on the truck tractor, making the net daily movement per tractor 146.4 yards, 205.0 tons or 31.0 ton-miles. Including the body weight estimated at 3,500 pounds, the gross loading was just over 10 tons per trip and the gross haulage averaged 44.0 ton-miles per day. The actual working time was 53 out of a possible 63 hours, the remainder representing time losses for moving the shovel and other delays in the pit.

The motor trucks previously used moved faster than the tractors and averaged 56.5 trips daily during a 7-day period from January 19 to 25, inclusive, operating over frozen ground. The average loading was 2.25 yards or 3.15 tons per trip and the average net daily movement was 127.3 yards, or 178.2 tons or 27.0 ton-miles per truck.

Pair of Linn Tractors Owned by the Municipal Construction Co., in Heavy Going

Heavy Hauling on a Railroad Grading Job

Corrado & Galiardi Construction Co., Connellsville, Pa., handled a very interesting heavy cut and fill job of 4,000 yards for the new Pittsburgh & West Virginia Railroad near Charleroi, Pa. On this job they operated two Linn truck tractors and four 3½-ton motor trucks. Each group served one ¾-yard steam shovel. An analysis of the records kept by the contractors showed that the material moved by the truck tractors came to a total of $1.52 per net yard-mile and the material moved by the motor trucks cost $2.06 per yard-mile.

A 600-foot cut furnished the material for a 300-foot fill, 80 feet wide, adjacent to the cut. Approximately 41,000 yards of material were taken from the cut, all of which went into the fill. The trucks were used alone for a short time and then the two truck tractors were placed in the cut. An average of four motor trucks was loaded and kept moving by one ¾-yard shovel working in one side of the cut, and another ¾-yard shovel was kept busy by the two truck tractors. Grade and haulage conditions were identical for the two units. No grades of consequence were encountered and local depressions and humps were the same for both types of equipment.

The contractors took advantage of the conditions and to offset partially the slowing up of the trucks caused by the necessity of two turns per round trip, they operated them toward the remote end of the cut where longer runs gave them the chance to profit by their higher speed. The truck tractors were given the shorter haul from the end nearer the fill. The average one-way trip of the trucks throughout the job was 750 feet and that of the truck tractors was 500 feet.

The truck tractors were run up to the shovel, loaded, backed out to the fill, dumped and run forward directly to the shovel. With the trucks, it was necessary to back up to the shovel, run out on the fill, turn, dump the load, drive forward and turn again to back to the shovel which required more time.

EXCAVATION, CONCRETE HAULING AND GRADING

The Municipal Construction Co., Binghamton, N. Y., has handled a variety of heavy haulage jobs in the last 18 months which are of interest in this discussion. On one job, an excavation of 12,000 yards to form an artificial lake, there was a haul of about 1,000 feet each way with a 3 per cent grade against the load for the first 50 to 100 feet. The going was so bad in the soft black muck that the truck tractors could not be loaded to their maximum capacity and motor trucks were unable to pull through at all. Each of the Linn tractors handled about 150 yards per 9-hour day in an average of 35 trips. The loads weighed 6.35 tons net. The average daily haulage per tractor was 42 net ton-miles.

The second job consisted of hauling dry cement and mixed aggregate from a batching plant to a concrete mixer engaged in laying a road. The truck tractor bodies were divided into 5 sections, each section containing one mixer batch proportioned 1:2½:3. The average haul was 6,600 feet each way over a newly graded fill of sand and clay. The tractors made this haul easily in about 40 minutes per round trip, each unit carrying 108 yards of 141 net tons per 10-hour day. The loads weighed 9.4 tons each. The average 10-hour haulage was 176 net ton-miles.

The third job involved a haul of 2,000 feet one way to dump sand on a fill. The job was fairly level and comparatively soft. The truck tractors carried about 4½ yards or 6.1 net tons per trip and made 32 trips per day of 9 hours. The total haulage was thus 144 yards, 195 tons or 74 net ton-miles per truck tractor per day.

HAULING COSTS

These three jobs were handled with the same two Linn tractors which were bought in 1929. On the artificial lake job the cost averaged 23.5 cents per yard, 15.8 cents per net ton carried or 83.8 cents per net ton-mile.

Following this the same machine operated on the 1¼-mile run handling dry cement and aggregate from batching plant to mixer. The cost was 27.7 cents per ton or 22.2 cents per net ton-mile. The same two machines used on the grading job following this made 32 round trips of 4,000 feet each in 9 hours at a cost of 24.4 cents per yard, 18.0 cents per net ton and 47.5 cents per net ton-mile.

Some Causes *of the* Failure *of* Wire Rope

Prepared by the Engineering Department of the Williamsport Wire Rope Company

THERE is no part of a contractor's equipment that is more dependable than wire rope. There is probably no part of his equipment that receives less consideration and more abuse than wire rope.

Wire rope is an accurately made, finely finished product and should receive the same consideration and care as the other parts of one's equipment. It is not always a reflection upon wire rope if it deteriorates on an operation within a seemingly short time. When this happens do not immediately blame the wire rope. Look for other causes that may prove to be vital contributing factors to the shortening of the life of the cable.

CONDITIONS THAT DESTROY WIRE ROPE

To help the contractor to increase the life of his wire rope, we give here some of the most common causes that shorten the life of wire rope in various operations, and which are conditions to avoid:

Drums and sheaves of too small a diameter.
Reverse bends.
Rope of insufficient strength for load.
Rope of wrong construction for the service required.
Overwinding on drums.
Lack of lubrication.
Rope damage in handling or kinking.
Insufficient or faulty guides and rollers.
Sheaves out of alignment.
Deeply worn grooves.
Broken rim or grooves scored by an old rope.

Sheaves that turn hard or wobble because of worn or damaged journals.
Displaced rope guards.
Stones or other objects becoming lodged or anything that rubs or cuts the rope.
Sticky grabby clutches.
Bent shafts.
Loose bearings or anything that causes the pull on the rope to be uneven or jerky.

Rope life is absolutely dependent upon the condition of the machinery.

These Shorten Wire Rope Life

Some things that are not so obvious but that seriously affect rope life, chiefly from overstress, are:

Jerking.
Slack.
Acceleration of load.
Impact.
Differential stresses produced in multiple groove drives.

In any kind of hoisting operation it is important that the rope shall have no slack at the beginning of hoisting, else the load will be suddenly applied and the stress in the rope will be much in excess of that due to the load raised.

Exhaustive tests found that acceleration greatly increases the rope stress beyond that usually figured, due to the rope's elasticity. Tests on a 1½-inch diameter rope under actual operating conditions showed an increase of 130 per cent.

The force of a hammer blow is due to impact. A hammer weighing only a few pounds can produce a blow having a force of many tons, merely because its movement is arrested suddenly. For instance, when even a light load being lowered is stopped suddenly, the rope may be subjected to a force much greater than the power of the machinery could apply to it in hoisting.

If you take a piece of twine and pull it gently you'll find it will stand an unusual strain before breaking, but if you snap the same cord quickly it is easily broken. The same results occur with wire rope or any other kind of rope. Don't "snap" wire rope. Start to lift slowly.

A ⅝-inch diameter plow steel wire rope of 6 x 19 construction, with fiber core, has an ultimate strength of 15.5 tons and looks strong and rugged, but being composed of 114 wires about 0.041 inches diameter, it is readily seen that these individual wires cannot stand severe abuse without becoming seriously damaged. We have pointed out some ways to avoid damage to the individual wires and the rope before and after installation. If these recommendations are followed, wire rope should give good service.

When a wire rope, or any other material, is subject to accidental damage, the accidents do not occur at regular intervals and thus one wire rope may last longer than another because it was not damaged, or not damaged as much, by accidents.

Facts One Should Know

The outside wires of a wire rope being broken is not an indication that they are brittle or have failed from bending and fatigue. It is just as probable they were pulled in two. The outer wires have a higher stress than the inner wires even when the rope is straight. This is because they lie at a greater angle to the rope axis. The outer wires are also subjected to more stress than the inner wires when the rope is bent.

A wire rope may fail from overstress and yet actually part at some later time under comparatively light load, due to time and fatigue during operation. The action of failing is not always instantaneous, because at each repeated stress the rope or material approaches failure. It actually becomes weaker and less able to resist stress. It may reach a point close to failure under a heavy load and then actually fail some time later under a much lighter load.

Broken wires, broken strands and breaking of the entire rope may be caused by using a rope that is kinked or has been severely jerked.

Vibration, whipping and lashing are very destructive actions on wire rope. It is easy to realize the jerk or shock at the fastenng when the rope whips. Vibration has somewhat the same effect, the amount of force is small, but the rapidity builds up an extremely large number of blows in a short time.

The manner of running a machine always affects its general maintenance. It is a well known fact that some people are harder on machinery than others. Frequently the operator who is hardest on machinery is the most efficient from an economic standpoint because sufficient additional production is secured to more than offset the additional cost. When this policy is pursued, there can be no basis for criticism of the wire rope.

Treat Wire Rope Fairly

Use wire rope under the best conditions wherever and whenever possible.

A contractor should avail himself of the service of wire rope experts, although he may feel perfectly competent, and perhaps is, to judge the proper rope to be used and the conditions under which to use it. As a rule engineers are found heartily willing to give a conscientious and unselfish opinion on any question submitted to them. They are meeting every day, with various conditions viewed from many angles, and their experience is worth having.

Use the Right Ropes

Those who are concerned with the buying and using of wire rope should know these fundamental facts:

One construction and grade may be well suited for mining operations and the same construction and grade wholly inadequate for a dragline or for use on excavators.

Another construction and grade may be proper for ship riggings, but be wholly unsuited for crane work.

Each operation must have the proper wire rope for the work required. It is frequently advisable to obtain the recommendation of an experienced service engineer to get wire rope of the right construction and grade. This is the most accurate way to insure greatest efficiency from the wire rope on various operations.

Keep an Accurate Record

Keep an accurate history of the rope. In this manner the user will not only secure greatest efficiency from his wire rope, but it will prove exactly which grade and construction is best by actual service.

STUDY THE CABLES

Since wire cables are made up of strands twisted together symmetrically according to a definite geometrical arrangement, it is highly desirable to know something about the construction of the strands that compose the cable.

ROPES REMAINING IDLE

When wire rope is left idle on an operation for some time and the operation again starts, a rapid deterioration may be expected to take place in the rope.

It is the nature of steel and hard fiber to do this and nothing can be done to prevent it if wire rope is left on the operation. The proper way to handle rope on an operation that is shutting down is to take the rope off and put it on a reel after lubricating it with a good grade of heavy lubricant.

When reeling the rope, be sure to place it on the reel the same way it is bent around the drum. Use the same precaution when putting it back on the drum.

CHANGING ROPES

Changing ropes from one operation to another often means quick destruction.

In the past years many operators have been borrowing ropes from one operation and installing them on another, to keep the ropes in service. The result was very rapid deterioration, and a consequent criticism of the wire rope.

When a wire rope is removed from its orginal installation and subjected to duty on sheaves of a different size, direction or operation, it will crystallize and go to pieces in a very short time. This is an expensive economy.

EFFECTS OF SEVERE HEAT

On foundry cranes where wire rope is subjected to severe heat the operator must expect rapid disintegration. Wire rope with hemp centers cannot be used in such service with good results. It must contain a wire strand center.

LUBRICATION

Proper lubrication of wire rope is very important. And this is neglected more than any other thing pertaining to its care.

Wire rope should be frequently lubricated with a thorough application of good lubricating oil, free from acids and corrosive substances, of a consistency that will penetrate to the center of the core. It must be heavy enough to remain as a coating on the outside, except when abrasive material would cling to the exterior lubricant and cause rapid wear. Under this condition the rope should be dry on the outside.

The life of a wire rope is materially increased by proper lubrication, as the lubrication is not only a protection against rust, but lessens the friction between the wires.

Wire rope should be coated with grease when not in service for when wire ropes are idle the chances of rust destruction are greatest.

GALVANIZED WIRE ROPE

It has been thought by some operators that galvanized wire rope will diminish the risk of rust. This is true only when used for guys, hawsers, ships' rigging, suspension bridges and occasionally for running ropes for ships only.

Galvanizing is of no benefit to wire rope in motion around drums and sheaves because the zinc wears off rapidly.

Treat wire ropes with the same care given to other machinery and they will give, in return, a full measure of good service.

EDITOR'S NOTE.—This article is copyrighted by the Williamsport Wire Rope Company.

A Novel Method of Handling Concrete for River Piers

ON the New York Street Bridge job in Aurora, Ill., the contractor handled the concrete in a very efficient manner. Falsework trestling was employed to support a narrow gage railroad which was used to carry the mixed concrete from the S-28 Ransome building mixer out over the river to the piers where it was chuted directly into the forms.

The aggregate was delivered from a gravel washery at North Aurora by a fleet of trucks which backed up an 8-foot ramp and dumped into the bucket elevator boot. The material was elevated 30 feet into a Seaverns Type H, 50-yard bin equipped with a 3-ton batch weigh hopper where all batchers were accurately weighed before they were dumped into the Ransome building mixer. The batch was then discharged into the Seaverns 33-cubic foot hopper-bottom cars fitted with overcut gates which discharged into the hoppers on the concrete chutes. Two-car trains were run continuously, thereby keeping the mixer plant going without interruption. Two cars were filled at the same time that two were being run out on the bridge to the work. A 5-ton Plymouth gasoline locomotive was used to pull the hopper-bottom cars.

This method was developed and used by the John Ward Co., Aurora, Ill., contractors for this bridge job.

The Aggregate Bins, Batcher, Mixer and Narrow Gage Railroad for Handling the Concrete on the New York Bridge Job, Aurora, Ill.

Blanket of Ice Keeps Green Concrete Warm

WHEN the Kansas City weather man forecast a drop in temperature of 15 to 17 degrees below freezing for the night of December 1, 1930, the Long Construction Co., building the William Rockhill Nelson Gallery of Art, faced the two problems of pouring 600 cubic yards of concrete in a single working day and protecting it while green from injury by frost.

The job was accomplished with almost two working hours to spare and Art Row, Superintendent of construction, had the green concrete safe under its ice blanket by quitting time. This blanket was made by spreading a 6-inch layer of straw over the concrete and spraying the top with water, which quickly froze into an airtight sheet in the frosty air.

Underneath the slab, coke-burning salamanders were put on the job, and, above, the straw supported the film of ice that sealed the air chamber.

This great concrete slab forms part of the first floor of the Art Gallery covering the basement that will house the various plumbing and electrical equipment, the installation of which can now continue throughout the winter.

Efficient organization and equipment made possible the pouring of the concrete in record time. The two large plants of the Ready-Mixed Concrete Co. delivered the 1:2¼:3½ mix into a fleet of thirty self-dumping White trucks. Two Lidgerwood hoists, with a third ready for any emergency, conveyed the concrete to the workers, who in turn transferred it to the waiting forms. The crew of 110 construction workers were kept supplied with such clock-like regularity that no time was lost.

With thirty minutes off at noon for lunch, the last form was filled by three o'clock. Despite the fact that the work was unexpectedly speeded up, no detail was slighted or any of the work allowed to fall below the standard maintained by the company in charge.

New Cut-Off Opened by Missouri-Pacific Railroad

A 3½-MILE stretch of new railroad on the cut-off of the Missouri-Pacific lines between Jedburg and Eureka, St. Louis County, Mo., was opened on January 16. This new shortcut, eliminating numerous curves, elevating tracks above the reach of floods and shortening the distance between the two towns by 2 miles, crosses the Meramec River at Jedburg, continues westward and crosses the river again about 2 miles northeast of Eureka. The cut-off is part of a 10.4-mile double track construction between Lake Hill and Eureka which is being completed at a cost of $4,500,000. A double track line through this section was opened on February 1, completing double tracks between Jefferson City and St. Louis, with the exception of 2½ miles between Kirkwood and Lake Hill. This sector is the last unit in the $20,000,000 construction program begun in 1925 for a double track main line from St. Louis to Kansas City.

A feature of the line completed in 1930 was tunneling through the limestone of Gray Summit Hill for 1,580 feet, a change that brought the line 125 feet directly under the town of Gray Summit. Another tunnel 550 feet long was necessary about a mile south of Labadie. The tunnel work was described in detail in an article in the October, 1929, issue of CONTRACTORS AND ENGINEERS MONTHLY.

A Section of the Big Floor Slab Being Poured. Note the Wood Tower with a Truck Delivering Ready-Mixed Concrete to the Bucket, and Also the Ramp and the Conical Bins for Handling Concrete in the Left Foreground.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

When a Contractor Loses His Contract Copy

If a contractor were to lose his copy of a contract and specifications, would the owner be bound to furnish him another copy or permit inspection of the owner's? It is possible, although doubtful, that the owner's refusal would constitute such wrong as would justify the contractor in abandoning the contract and suing for damages.

A recent decision of the California Supreme Court seems to reflect fairly the general rule of law applicable to cases of this kind. (McKeon v. Neuschwander, 286 Pac. 1010.) There a lessee had lost his copy of a long-time lease and the lessor refused to exhibit his copy. That resulted in loss of an opportunity for sale of the tenant's interest under the lease.

The court decided that the lessee could maintain a suit to establish the terms of the lost lease, but that the lessor committed no legal wrong in failing to show his copy of the contract. The opinion says:

"Plaintiff's alleged loss is chargeable to his own carelessness in misplacing, or his misfortune in losing, his copy of the lease, rather than to any violation of a legal right or breach of a legal duty by the defendant."

Had the California tenant recorded his lease, the securing of a certified copy would have been a simple matter.

When Verbal Promises to Pay Another's Debt Are Binding

From the very beginning of business dealings experience proved the wisdom of having all commercial agreements reduced to writing, and for several hundred years it has been established law among English speaking people that certain types of agreements must be in writing and be signed by the obligor in order to be enforceable.

One of these types of agreement is a promise by A that he will pay B's debt to C. Ordinarily, A is not liable on such a promise, unless it is reduced to writing and signed by him. But this does not mean that A cannot orally bind himself to pay for something that is delivered to B by C on A's credit.

So, in the case of Welch-Sandler Cement Co. v. Mullins, 31 S. W. 2d. 86, finally disposed of by the Kansas City Court of Appeals May 26, 1930, it was decided that an oral promise on the part of the president of a construction company to pay for materials delivered to the company on the faith of that promise was binding.

Upholding a judgment in favor of the material man in that case, the court said:

"The fact that deliveries were made to the construction company pursuant to the agreement of the parties and that it was known to the plaintiff that the construction company intended to use the materials does not alter the situation."

Referring to two previous Missouri court decisions, the court stated:

"In both of these cases it was held that in the absence of a writing it is necessary, in order to hold one for the price of goods delivered to another, not only to show a promise upon defendant's part, but to also show that the credit was given solely to the parties making the promise."

Relation Between General Contracts and Subcontracts

In a general way there is a resemblance between the man in the old wheeze, who posted a long written prayer at the head of his bed and who every night, instead of repeating it, merely pointed to it, saying, "Lord, those are my sentiments," and the man who takes a subcontract.

The "sentiments" expressed in a general contract are usually understood as being intended to be incorporated into subcontracts by reference. However, that applies only to provisions reasonably germane to the subcontract. As said by the Utah Supreme Court in an opinion filed July 21, 1930, in the case of Inland Engineering & Construction Co. v. Maryland Casualty Co., 290 Pac. 367:

"A mere reference to the general contract and the provision in the subcontract that the subcontractor is to be bound by the terms, plans, and specifications of the general contract cannot enlarge the terms or conditions of the subcontract, which is limited to certain definite and specific items."

Binding Contract May Appear in Correspondence

"We will furnish cut ready to set all limestone required in erecting that post-office building in Yonkers, N. Y., as per governing plans and specifications, for $57,000," bid subcontractors in a letter to the general contractor, who bid on the post-office job. "For $25,000, we will do all hauling, setting, cleaning and pointing of the stone."

"We've made other arrangements about procuring the stone," wrote back the general contractor, "but we accept your estimate of $25,000 for hauling, etc. As soon as the contract is awarded to us we will enter into contract with you in a more detailed form, for the prosecution of the work." The subcontractor assented to these conditions.

But later the general contractor wrote that, on account of labor union conditions, all the masonry work would have to be done by the same subcontractor and that therefore unless the subs would bid on the brickwork also, the general contractor wouldn't let them do the stone setting, etc. The subs did not care to bid on the brickwork and sued the general contractor for damages for breaking the agreement evidenced by the correspondence above summarized. The general contractor denied that a contract had been consummated, because no formal contract had been entered into as contemplated by one of the letters from which we have quoted.

In an opinion filed June 12, 1930, in the case of Agostini v. Consolvo, 153 S. E. 676, the Virginia Supreme Court of Appeals ruled that there was a binding contract, saying:

"Where the minds of the parties have met, and they are fully agreed, and they intend to be bound, there is a binding contract, even though a formal contract is later to be prepared and signed.

"The stipulation in Agostini's [the general contractor's] letter to embody their agreement in a formal contract does not affect its validity, and they have no right to use that stipulation to impose additional terms or obligations or to evade the performance of the agreement."

Construction Industry News

Good Roads Machinery Co., Inc., Kennett Square, Penna., has announced that Mussens Limited, Montreal, Canada, has been appointed distributor for that company throughout the Dominion of Canada and will handle the following Good Roads products: Champion and Climax crushing equipment, Good Roads power graders, drawn graders, road drags, bituminous distributors, cold application distributors, chip spreaders and the Good Roads line of high speed snow plows for motor trucks and busses.

The Kentucky Rock Asphalt Co., Louisville, Ky., has recently appointed M. A. Lippman, former instructor in civil engineering at the Polytechnic Institute of Brooklyn, N. Y., as its representative in charge of the New York, New Jersey and New England territory. Mr. Lippman, who is well-known among highway engineers and highway officials in this territory, has established offices at 11 West 42nd Street, New York, N. Y.

Link-Belt Co., Chicago, Ill., has recently appointed the McFarland Tractor & Equipment Co., St. Joseph, Mo., as its distributor for Link-Belt crane-shovel-draglines in Atchison and Doniphan Counties in Kansas and seventeen counties in northwestern Missouri. **Link-Belt Ltd.**, Toronto, Montreal and Vancouver, Canada, has announced the appointment of the Manitoba Bridge & Iron Works, Ltd., Winnipeg and the Riverside Iron Works Ltd., Calgary, as its representatives in Manitoba and Saskatchewan, and in Southern Alberta respectively.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the opening of a new branch house for the sales and service of Allis-Chalmers agricultural and industrial tractors at Sioux Falls, S. D. Karl H. Schweider is Manager of the new branch at 202 North Main St. A sub-branch will be maintained at Rapid City, S. D.

Burton Explosives, Inc., Cleveland, Ohio, has appointed L. D. Nuchols as its Southern sales manager with offices at Nashville, Tenn.

Hydraulic Development Corp., 50 Church Street, New York City, has announced that Kenneth G. Sites has joined the sales organization and will sell Hydro-Tite in New York, New Jersey and Pennsylvania. Mr. Sites will work out of the main sales office in New York.

R. G. Le Tourneau, Inc., Stockton, California, manufacturers and designers of a line of heavy grading equipment has announced that the Davenport Locomotive & Manufacturing Corp., Davenport, Iowa, will manufacture and sell the Le Tourneau line of equipment in the eastern and middle-western states under the name of Davenport-Le Tourneau equipment.

The Gledhill Road Machinery Co., Galion, Ohio, is a new company which plans to produce a line of drawn graders and other road building and maintenance equipment. E. C. Gledhill, formerly with the Rome Manufacturing Co., is head of the new concern.

Hardsocg Wonder Drill Co., Ottumwa, Iowa, has recently appointed the Roy C. Whayne Supply Co., Louisville, Ky., as its exclusive distributor for Wonder rock drills, paving breakers, clay spades and drill sharpeners in the state of Kentucky. The Whayne company will carry a complete stock of new drills, as well as repair parts, for immediate delivery.

Chain Belt Co., Milwaukee, Wis., has announced that Clifford F. Messinger, formerly Vice President and General Manager, was elected President at the December meeting of the Board of Directors, to succeed his brother, C. R. Messinger, who resigned to become President of the Oliver Farm Equipment Co., and Chairman of the Board of Directors of the Chain Belt Co. G. K. Viall, Works Manager since 1929, was elected Vice President.

Barber-Greene Co., Aurora, Ill., held a sales conference at the main offices and plant just previous to the Road Show. The conference took the form of an instruction course with lectures and laboratory work with fifty-five representatives in attendance. Officers of the company and various guests of honor addressed the salesmen. Educational movies were shown, a demonstration of the new Black Top Road Builder was held and a review given of all the machines now produced by the Barber-Greene Co. After the meeting many of the representatives left for the Road Show.

Distributors' Bulletin Board

The distributors of construction equipment listed below have made changes in their cards appearing in the Distributors' Directory on pages 131 *to* 158 *of this issue of* CONTRACTORS AND ENGINEERS MONTHLY:

Chadwick Machinery Co., San Antonio, Texas
Clark & Burrows, Inc., Dallas, Texas
The Day & Maddock Co., Cleveland, Ohio
Dukehart Machinery Co., Des Moines, Iowa
Elken Tractor & Equipment Co., Minot, No. Dakota
General Tractor & Equipment Co., Minneapolis, Minn.
J. F. Lowe Co., Chicago, Ill.
E. A. Martin Machinery Co., Joplin, Mo.
M. D. Moody, Jacksonville, Fla.
Mussens, Ltd., Montreal, Canada
North Jersey Tractor Co., Inc., Garwood, N. J.
Pacific Hoist and Derrick Co., Seattle, Wash.
Service Supply Corp., Philadelphia, Penna.
Slade Tractor Co., Inc., Albany, New York
Herbert N. Steinberger Co., Denver, Colo.
Sterling Tractor Equipment Co., Brooklyn, New York
Truck and Tractor Equipment Co., Ltd., Toronto, Canada
Wallace Equipment Co., Detroit, Mich.
The Wheeler-Murray Co. Buffalo, N. Y.
Wm. H. Ziegler Co., Inc., Minneapolis, Minn.

The Longest Tunnel in the World

The first authoritative article to be published on the construction of the New York City Water Tunnel No. 2, which will be the longest continuous rock tunnel in the world, will appear in the March issue of CONTRACTORS AND ENGINEERS MONTHLY. *This project includes the sinking of* 10,270 *feet of shafts, of which* 840 *feet are in nine large pneumatic caissons, the excavation of* 1,627,000 *cubic yards of rock in the shafts and the* 20 *miles of tunnel and the placing* 642,000 *cubic yards of concrete in shaft and tunnel linings. The total estimated cost, based on bid prices, is* $42,692,567.50.

The Ransome 14-S STANDARD BUILDING MIXER

ONCE again "The Mixer with a Background" has scored a triumph. For now, in the new 14-S Model, have been incorporated many of the new improved features which have made the larger Ransome Mixers the leaders in their field.

A new Bulletin, No. 127, is brimful of illustrations and facts about this new, improved Ransome 14-S Standard Building Mixer. No road contractor—no engineer—should be without a copy. Note at the left, a few of the reasons why you should know more obout this member of the Ransome family. Then fill in the coupon below, mail it to us and the copy that is waiting for you will be sent immediately—without obligation.

Highlights of the Ransome 14-S

1. Has the famous Ransome mixing action.
2. Drum capacity amply cares for a full three bag batch of 1-2½-4.
3. The power loader bucket discharges its load quickly and cleanly—in seven seconds.
4. A round two-piece discharge chute, operated by a large hand wheel, discharges the load from the drum in from 7 to 9 seconds.
5. Automatic, accurate water supply is assured with the Ransome Spiral Cut-off Water Tank and Non-By-Passing Valves.

Many other important features are given in detail in Bulletin No. 127. Make sure that you receive your copy.

Ransome Concrete Machinery Company
1850—Service for 81 Years—1931
Dunellen **New Jersey**

Write for BULLETIN Nº 127 Today it's FREE

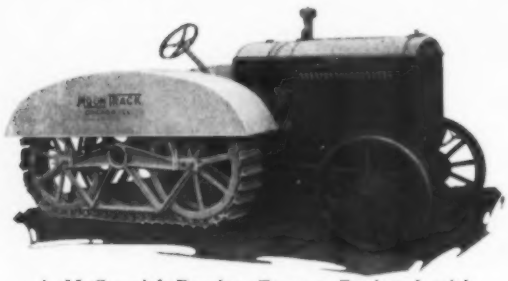
Ransome Concrete Machinery Co.
Dunellen, New Jersey

You may send my copy of Bulletin No. 127 about the 14-S Mixer.

Name_____

Address_____

City_____ State_____



A McCormick-Deering Tractor Equipped with Moon Tracks

Semi-Crawler Tracks for Industrial Tractors

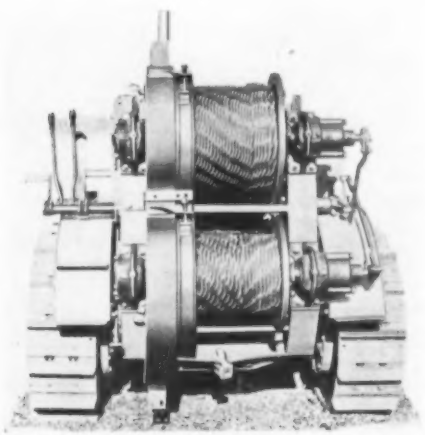
TRACKS built with sprockets of solid manganese steel, shoes of chrome alloy, heat-treated, and the frames of which are Tenso steel high in manganese and heat-treated, are now being manufactured by the Moon Track Company, Inc., McCormick Building, Chicago, Ill., for McCormick-Deering Models 20 and 30 industrial tractors. A feature of the mechanism is the simplicity and small number of parts. There are no intricate or involved parts to master, no uncertainty about adjustments, and no difficulty in attaching the track to the tractor, according to the manufacturer.

Moon Tracks can be attached in about one hour and the method of attachment is so simple that any man accustomed to handling equipment can do the job. These tracks fit on the rear tractor axle in place of the drive wheel. The steering mechanism, including the front wheels, remains intact. It is stated that these tracks when attached to McCormick-Deering tractors will double the draw-bar pull.

The flexibility of the tracks makes for smooth operation, and the operator rides at ease at all times. The tracks respond to manipulation readily and with minimum effort on the part of the operator. The only bearings in Moon Tracks are Timken bearings in the idlers. The entire track runs dry, without oiling, and adjustment is said to be seldom necessary. The only adjustment is for wear and stretch of the tracks. Track wear and play are taken up by adjusting eye-bolts on each idler.

A Double Drum Dragline Unit

A DOUBLE drum dragline unit especially designed for attachment to a Caterpillar Sixty tractor has been announced by the Pioneer Gravel Equipment Manufacturing Co., Minneapolis, Minn. This dragline drum unit is of extra heavy construction with large shafts, bearings and clutches. It is not a hoist, but is built for heavy dragline work and is equipped with Hyatt and Timken bearings in the drum unit.



Pioneer Dragline Drum Unit Mounted on a Caterpillar Tractor

The journal brackets or bearing housings are machined to fit perfectly. The machined-cut gears have a 4-inch face and large bronze bushings are used in the drums to avoid excessive wear in idling on the shafts.

The operator of the tractor can, from his seat over the fender of the tractor, operate the dragline and the 1¼-yard dragline bucket.

The capacity of this unit in feeding pit-run material to a hopper ranges from 400 to 750 cubic yards per 10-hour day. The variation in yardage depends upon the length of the haul, the type of material, and the size of the bucket used.

A Side Boom Unit for Contractors for Use in Pipe Handling

A NEW side boom unit for attachment to the Model U Allis-Chalmers industrial tractor has recently been announced by W-K-M Co., Inc., 220 Roberts St., Houston, Texas. Although designed especially for pipe line work, the utility of the machine is not confined alone to this particular field of handling activities. Operators in general construction work, highway maintenance, public utility projects, etc., will find a use for the unit.

W-K-M Side Unit for Allis-Chalmers Model U Tractors

The boom lifts and carries loads of 3,000 pounds with apparent ease when properly counterweighted and much heavier loads when a stiffleg is employed. The unit is easily manoeuvered on the job or when traveling, being compact in design and construction, with the main working parts of the machine close to the body of the tractor and controls within easy reach of the operator. While in transportation from one job to another, the unit can be driven at the speed of a passenger car. Installation, which requires no drilling or cutting, can be accomplished in the field or at the factory.

Expensive Economy

A CONTRACTING concern hauled an over-width machine on a highway at night to save daylight tie-up of work. Lights were not at hand so it was moved without them. Three accidents occurred which cost the concern over $30,000. —*Tracy Headlight-Herald.*

Be Prepared for that Wet Job!

DON'T LET THE WATER HAZARD JEOPARDIZE YOUR PROFIT ON THAT EXCAVATION, SEWER, PIPE LINE OR BRIDGE JOB—

Get "Domestic" Pumps and Be Safe

Sizes and types for all conditions encountered by Contractors

For Volume Pumping use "Domestic" Self-Priming Centrifugal Pumps.
2½ in., 3 in., 4 in., 5 in., 6 in. and 8 in. suction and discharge sizes. Capacities—200 to 2000 g.p.m.

For Seepage or Clean-Up Pumping duties use "Domestic" Single and Double Diaphragm Pumps
Furnished in 3 in. single and 4 in. single and double Pump Units.

—Write us today for descriptive bulletins—

DOMESTIC ENGINE & PUMP CO., Manufacturers, Shippensburg, Penna.

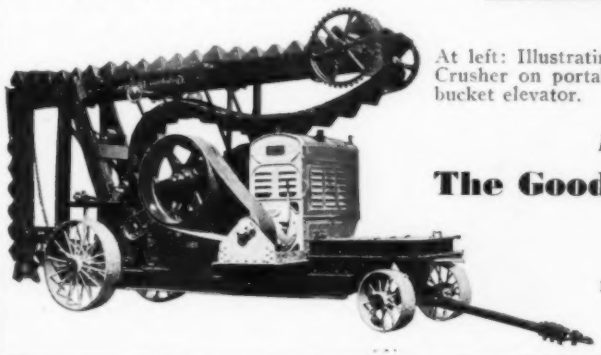
—Distributors in all principal cities throughout the U. S. A.—

THE Good Roads MACHINERY LINE

A simplified, highly efficient line of modern equipment . . . for the production of crushed rock or gravel and sand . . . to meet present rigid specifications.

Above: The "Good Roads" Model Y-90 Portable Crushng, Screening and Loading Plant. A complete "closed circuit" system. Power unit can be placed on plant chassis if desired. Equipped with "Good Roads" Champion Roller Bearing Reduction Crusher.

At right: The "Crushermobile," a product of "Good Roads." A compact and complete crushing, screening and loading plant, with "open or closed circuit" feature as desired. Self-propelled and operated. Moves from job to job under its own power, and follows the shovel or feeder right into the bank.



At left: Illustrating "Good Roads" Champion Roller Bearing Reduction Crusher on portable mounting. Complete with power unit and folding bucket elevator.

Division of Crushing Equipment

The Good Roads Machinery Co., Inc.

Kennett Square, Pa.

BRANCHES

PHILADELPHIA NEW YORK PITTSBURGH
WATERTOWN, MASS. CHICAGO
HARRISBURG, PA.

An Improved Carbide Light

A V-G Light

LATE afternoon construction work and nightwork is facilitated through the use of carbide lights of great candle power scattered around the job. National Carbide lights sold by the National Carbide Sales Corp., Lincoln Building, New York City, are in extensive use on railroads and among city departments and contractors throughout the country. These lights have been improved during the last year by advanced production methods and technical changes. The carbide feed plunger has been made more positive in its action by changing from a smooth to a spiral feed on both the VG light and Handy-Light.

The National Carbide Handy-Light has been improved by the adoption of the more expensive feed control and spring mechanism, formerly used only in the large type light. Great improvement has been made through the use of chromium alloy reflectors which are not subject to discoloration and tarnish as were the older types. These lights are readily portable and need little servicing in the field other than the daily refilling with carbide.

A New Model Industrial Tractor

A MODEL 30 McCormick-Deering tractor is the latest addition to the industrial power family of tractors manufactured by the International Harvester Co., 606 South Michigan Avenue, Chicago, Ill. The Model 30 is similar in construction to the Model 20 except for its increased capacity. It has forward speeds of 2.5, 4.2, and 6.7 miles per hour.

The Model 30 industrial tractor is powered by a 4-cylinder valve-in-head engine. The cylinders have a bore of 4¾ inches and a 6-inch stroke. Operating at the governed speed of 1,050 rpm, it develops over 40 horsepower on the belt. The belt pulley can be replaced by a sprocket or a shaft power take-off. Outstanding among the features of this new tractor are the removable cylinders and crankshaft ball bearings. The removable cylinder feature is included as it is a well-known fact that cylinders will wear after years of use. In order to compensate for this wear, it is necessary to do one of three things. First, replace the engine block; second, rebore the block and buy oversize pistons; or third, replace the cylinders. The third or last of these is far more economical and at the same time retains the original size of the cylinders.

The foundation of the Model 30 industrial tractor is a one-piece main frame. This construction is designed to eliminate twisting, weaving, and warping of the frame. Each unit including the engine, clutch, transmission, final drive, etc., is assembled complete and then placed in the main frame. This method of unit-construction reduces adjustment and overhauling expense to a minimum. It also permits steady disassembly if service is required while working on a job. Ignition is supplied by a high-tension magneto, lubrication is of the circulating splash type and the Model 30 is equipped with a built-in oil filter for conserving the lubricating facilities of the oil. The carburetion system is equipped to operate on kerosene or gasoline. It has an 86-inch wheel base and a total overall length of 129 inches. It is 66 inches wide and 70 inches high to the top of the steering wheel. The tread is 52 inches wide in front and 54 inches wide in the rear. The tractor has a turning radius of 16½ feet. Heavy-duty internal energizing brakes are regular equipment. An auxiliary hand brake operating on the countershaft is regular equipment. The rear tires are quickly removable.

The New Model 30 McCormick-Deering Tractor

A Berg Hi-Way Surfacer in Use on a Section of Ohio State Highway No. 74 Near Newton, Ohio

Air Cleaner with Protective Covering for Highway Surfacers

THE engine of the Berg Hi-way Surfacer is now built with a special covering and large air cleaners are built into the machine in the rear for protecting all parts of the engine. An air cleaner is also mounted on the engine inside of the housing to protect the carburetor.

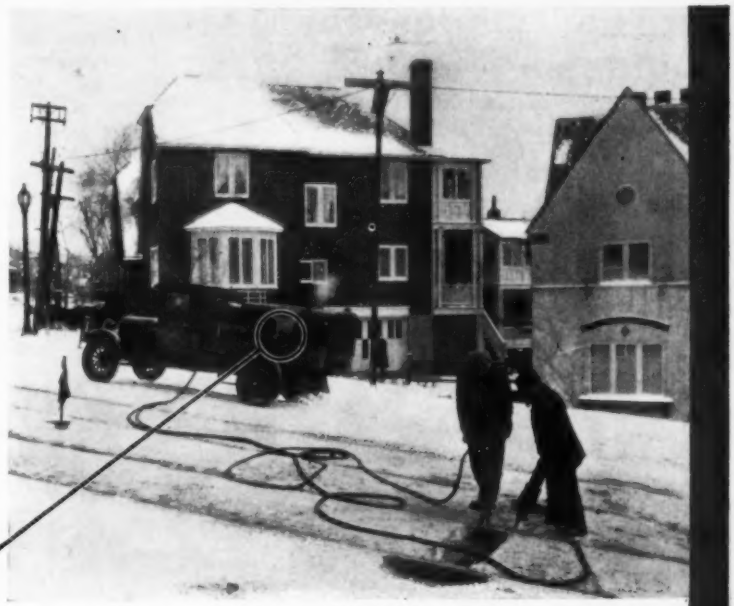
The accompanying photograph taken on State Highway 74 near Newton, Ohio, last month shows one of these new machines which was purchased and has been used extensively by the De Salvo Construction Co., Cincinnati, Ohio. The Berg Hi-way Surfacer is made by the Concrete Surfacing Machinery Co., Cincinnati, Ohio.

Error in Diagram

IT is not necessary to call the attention of brick paving contractors to the obvious error in the diagram on page 88 of the January issue of CONTRACTORS AND ENGINEERS MONTHLY where the thickness of the sand cushion is stated to be 6 inches instead of 1 inch.

. . . and it was *FREEZING COLD*

But why waste valuable hours starting the compressor just because it is cold. With a "SCHRAMM" on the job, it's an easy task to crank the engine ONLY, let it warm up for a few minutes and then throw on the full compressor load—all set for a big day's work. "SCHRAMM" HAS A CLUTCH.



Here is the distinctive "SCHRAMM" clutch. It permits starting engine without compressor load.

A No. 120 truck mounted SCHRAMM compressor operating two paving breakers for the Montreal Tramways Co. at Westmount, a suburb of Montreal . . . and it was cold.

There are other features—ask for the catalog.

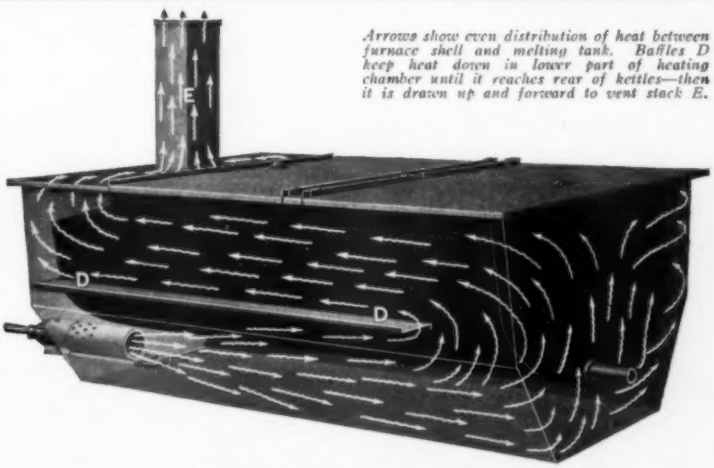
SCHRAMM, INC.

West Chester, Pa.

Stocks and Service in All Principal Cities

What is the MEANING of DOUBLE HEAT CIRCULATION?

Double Heat Circulation is a method of heating used in a number of Littleford Oil-Burning Asphalt Kettles. It is responsible for the remarkable heating ability of these kettles.



Arrows show even distribution of heat between furnace shell and melting tank. Baffles D keep heat down in lower part of heating chamber until it reaches rear of kettles—then it is drawn up and forward to vent stack E.

Of Direct Benefit to Men on the Job

The melting tank is different. Screen A forms two reservoirs: B for cold material; C for hot, melted material. Cold asphalt can be added in any quantities at any time without chilling the melted material.

There are no vent holes on the sides of the kettle. Outside temperature of the kettle is greatly reduced and inside heating efficiency is greatly increased. Coking, burning and over-heating are definitely eliminated because the heat is evenly distributed over the entire kettle. Less fuel is used and speed of melting is greatly increased. Let us tell you more about Double Heat Circulation Asphalt Kettles—the safest ever made.

LITTLEFORD

Road Maintenance Equipment

SINCE 1900

LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

A Jack Hammer for Medium and Hard Ground

The L-6 Rotator

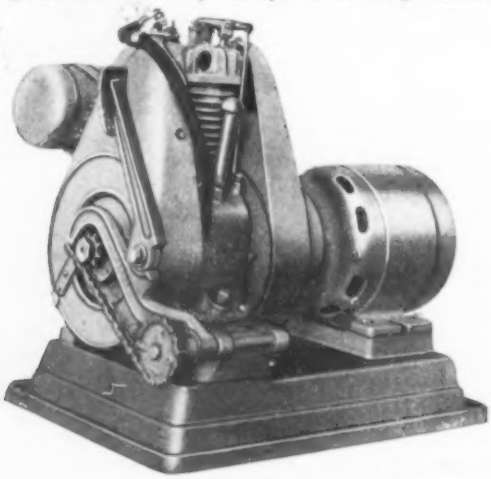
A NEW pneumatic drill of the jack hammer type, known as the Rotator L-6, designed for use in medium and hard ground, has been announced by the Sullivan Machinery Co., 400 North Michigan Ave., Chicago, Ill. The L-6 is a utility drill, in view of the wide variety of rock conditions which it can handle. Among the distinguishing features listed by the manufacturer are: relatively low weight in proportion to drilling capacities, enabling one-man operation under all conditions; compact well-balanced design; rugged, substantial construction; new 4-position throttle with the hole cleaning depth under control of the single throttle lever; positive automatic rotation of the drill steel by improved rifle-bar; complete automatic lubrication; a single oil reservoir; the Sullivan independent differential 3-spool valves, assuring a powerful snappy blow; adaptability to use on various types of mountings; and complete interchangeability of parts.

The Rotator L-6 weighs 58 pounds and is easily handled by one man in all down-hole drilling and for much flat-hole work. Where a plank is used for support on flat or angle holes the flat back of the drill, in normal work the side next to the operator, makes handling easier. If there is considerable flat hole or angle drilling to be done, the use of a cradle and shell for mounting the L-6 on a mining column or quarry bar or tripod is most practicable and convenient.

Electric Plants on the Job

WHETHER a quick portable source of night illumination must be had, or a lighting arrangement for consistent night after night operation to help keep up the construction schedule, some type of dependable lighting source must be installed. United States Motors Corp., Oshkosh, Wis., has developed a line of electric plants which are portable and made in 350, 400, 750 and 900-watt sizes and also, from 1½ to 15-kw capacity. The smaller sizes are particularly adaptable for installation on small construction jobs where light is a necessity.

The 350-watt model which furnishes 110 volts direct current in a steady flickerless output at constant voltage under all load conditions, is illustrated below. The current and voltage are maintained by the special wound generators, responsive governor action on the engine and the special spring coupling between engine and generator. This coupling has a unique torsion arrangement which takes up all the explosion impulses between the engine and generator. It is used on all the one-cylinder air-cooled models. The spring coupling can also be used as a belt power take-off drive up to the horsepower of the engine.



Model WS 350-Watt Electric Plant

The machine is completely self-contained and is equipped with a convenient plug-in socket. A convenient foot or hand lever starting arrangement is provided. The engine is air-cooled, single-cylinder of one full horsepower with a high tension magneto built into the flywheel and is equipped with the governor to regulate the engine speed and voltage. This model will operate 10 hours on one gallon of gasoline. The overall dimensions are: 26 inches long, 19½ inches high, 13¾ inches wide and the approximate net weight is 135 pounds.

A Self-Contained Electrically-Operated Car Puller

A COMPACT, economical and easily-operated capstan car puller of improved design has been announced by the Webster and Weller Mfg. Co.'s, 1830 N. Kostner Ave., Chicago, Ill. This Weller capstan car puller is built in three sizes to handle from one to six 80-ton cars. It is an electrically-operated unit, self-contained and weatherproof, and is designed to pull cars, trucks, etc., and other vehicles at any angle.

The Improved Weller Capstan Car Puller

A Precision Two-Speed Hoist for Crawler and Locomotive Cranes

A PRECISION two-speed hoist line control, which is of particular interest to those engaged in steel erection or general hook block lifting service where the accurate control of the load is of vital importance, has been announced by the Thew Shovel Co., Lorain, Ohio. This hoist offers the advantage of additional safety, both in protection against damage to fragile costly loads and to workmen on the job.

The new hoist is based on the principle of making both ends of the hoist line live. One end is fastened to the standard hoist drum in the regular manner. The cable is then reaved over the head of the boom down through the snatch or hoist block and returns over another sheave at the boom point, thence down the boom to the precision 2-speed hoist drum, located at the base of the boom.

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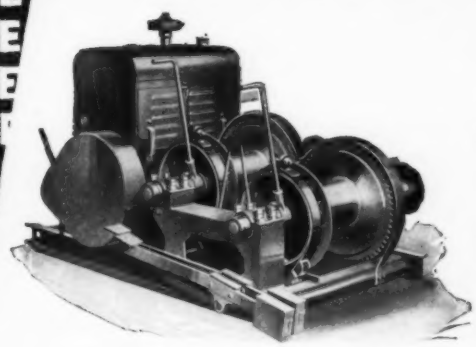

Features You Have AlwaysWanted in a Hoist

Low in Initial Cost. Take any model of a DAKE gasoline or electrically-operated hoist, and compare it feature-for-feature, detail-by-detail with other hoists on the market today—and you'll find it exceedingly low in initial cost.

Low in Operating Costs. Proof of this statement can be found on the books of every contractor using DAKE HOISTS today. The reasons are many — the large substantial bearings—the arc-welded steel construction—the steel drums—the ease of control — the powerful brakes — and the unusual lightness of weight —all of these mean low operating costs.

Low in Per-Year-of-Service Cost. DAKE HOISTS are designed and constructed to deliver 100 per cent satisfaction to both the owner and operator for a long period of time. Ask any DAKE user, he will tell you that DAKE HOISTS deliver genuine satisfaction.

It will pay you to take the time necessary to investigate DAKE HOISTS. May we send you our complete catalog on DAKE gasoline and electric hoists ranging from 2 to 27 Hp. and priced from $250.00 to $1900.00 f.o.b. factory.

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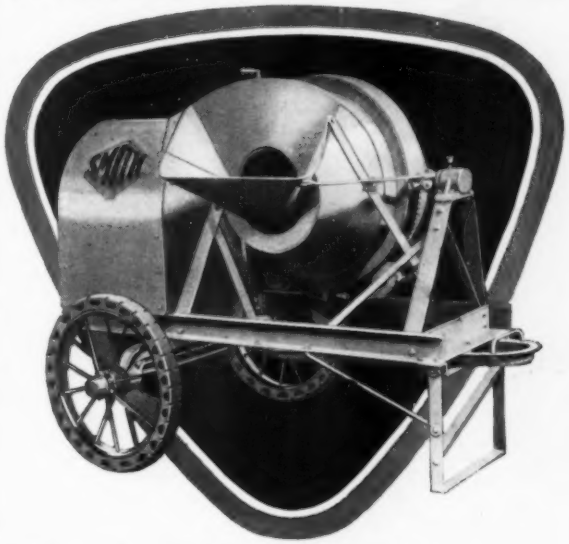
DAKE ENGINE COMPANY
Grand Haven, Michigan

SMITH
Tilters and Non-Tilters

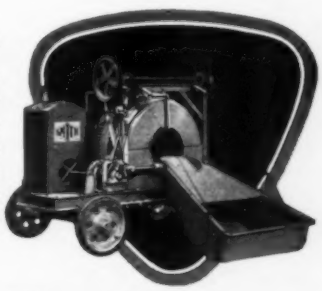


It's Easy to Shoot at a Big TARGET!

SMITH half-bag mixers are equipped with fast charging chute — a big roomy target for the shovel man to shoot at . . . 31″ wide and only waist high, this handy chute provides faster and easier loading than is possible with small mixers charged directly through the drum opening . . . There's no spilling — ALL the materials shoot swiftly into the drum. And by resting the bag on the hopper, you can add the cement directly from the bag — another convenient, time-saving feature.

7-S Non-Tilter

An all-around mixer for the small jobs. Balanced batch; "End-to-center" mixing action; big, quick-action skip; band clutches. Also Smith 5-S Tilter. Write for Bulletins.



National Equipment Corporation

N. 30th St. & W. Concordia Ave., Milwaukee, Wis.

A-6218½

The New Thew-Lorain Precision Two-Speed Hoist and an Application of Its Usefulness

The cable is dead-ended at this point on a small drum, mounted on the boom, near its base. This drum is driven in forward or reverse direction through the use of the standard shovel crowding mechanism on the travel shaft, a set of cut miter gears and an oil-enclosed self-locking worm drive. The driving sprocket and miter gears are mounted in line with the boom hinge pin so that changes in the boom angle do not affect the drive in any way.

By use of the crowd and retract lever, the small drum is revolved slowly, in either direction and is actuated from the position power control at all times, without the necessity of slipping the clutches, or taking a chance on their sudden grabbing and jerking the load. Whenever the control lever is in neutral, the automatic crowd brake is securely applied to the crowd shaft, giving additional safety and brake action over the self-locking worm.

In operation, loads are hoisted by the standard hoist drum, at standard high speed, to approximate position, then the hoist brake is set and through the use of the crowd lever, the precision 2-speed hoist is used to slowly and precisely raise or lower the load into position. Handling the load on a 2-part line, at standard engine speed, the hoist speed is 7 feet per minute and the lowering speed is 13.9 feet per minute. The small amount of power required to actuate the precision 2-speed hoist, however, enables idling the engine which gives a hoist speed of 3½ feet per minute or 2/3 inch per second, and a lowering speed of 7 feet per minute, with a range of speeds in between, depending on motor speeds.

Look to Your Boots

IN THE December issue of *The News Letter* of the Construction Section, National Safety Council, John Russell, Jr., Editor, notes an idea picked up in the West which should be of real interest, not only to building contractors, but also to contractors wherever a considerable amount of form work is being done.

This building contractor, who is out on his own work instead of being so big that he just sits in his office, causes a shoe inspection to be made on the job in the morning to locate men wearing sneakers, shoes with holes in them, thin soles, etc. This idea of a shoe inspection may sound silly at first, but there is no reason why the foreman on the job with orders from the superintendent should not make this shoe inspection, especially where there is a lot of slash or nail hazards on the job and it will mean eliminating lots of foot injuries and possible cases of tetanus or lock-jaw.

Keeping Dust Out of Your Construction Equipment

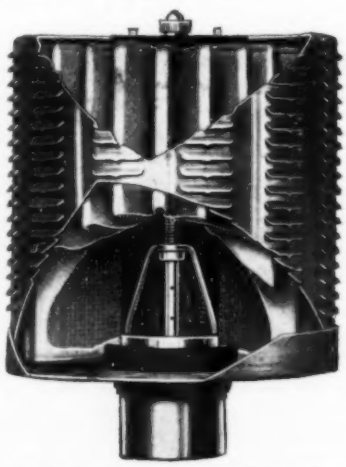
ORDINARY air, according to the U. S. Weather Bureau, contains an average of 100,000 particles of dust per cubic inch. On construction jobs, it is a well known fact, that in dry weather the dust and grit content of air is much greater. These sharp, gritty dust particles when drawn into air compressors, gasoline engines, or other air-using machines, score the cylinders, pistons, bearings and valves, create carbon and cause valves to stick and to waste compressed air or the compressed explosive charge, as the case may be.

To assure clean air and to make construction equipment operate from three to five times longer before repairs are necessary, many contractors are now equipping their compressors and tools with air cleaners similar to the Protectomotor air filters made by the Staynew Filter Corp., Rochester, N. Y. These air filters are guaranteed by the manufacturer to remove 99.9 per cent of the dust in air and thus prolong the effective life of the equipment.

The Protectomotor unit consists of a felt filter medium formed in pockets over radial wire screened fins, grouped around a central outlet. This arrangement provides a method of mounting a relatively large area of felt in a compact space and a system of support which allows the use of the entire available area of felt with a negligible restriction. Protectomotor inserts are made in varying capacities ranging from 15 cubic feet per minute to 250 cubic feet per minute. The large capacity inserts are designed to pass 250 cubic feet of free air per minute and contain 20 square feet of felt within a volume slightly less than one cubic foot. A test made some time ago by the University of California using standard dust, 98.6 per cent of which will pass through a 200-mesh screen, gives the Protectomotor air filter a filtration efficiency of 99.9 per cent.

Air enters these filters through slots in the aluminum housing, in which the felt filter is inserted and air must pass through the felt filter medium before it goes into the compressor or other machines, leaving the dust and grit on the outside.

These air filters are made in sizes ranging from the smallest size used on one-cylinder industrial engines to the large capacity size designed to pass large quantities of air for ventilating systems, dust recovery and similar uses.



A Sectional View of the Protectomotor Air Filter

1971 Aspirations..1871 Limitations

THE time to widen and straighten roads is before property values mount—not after. Road improvement will be less costly if done early.

Roads which accommodate only two lanes of traffic—roads with blind, sharp curves—do not fit the present or the future. For 1871, they were good enough; by 1971, they will lead only to deserted villages.

A good working understanding of the several ways improvement may be effected with Tarvia "Re-Tread" will encourage action where taxpayers are inclined to delay on the score of expense.

For Tarvia "Re-Tread" will provide dustless, rutless, easy-riding, ample-width roads at a cost that simplifies any financing problem. And a Tarvia "Re-Tread" road laid today for today's traffic will still be there as a solid foundation for further development when traffic hits the many-thousand-vehicles-a-day mark in 1941 or later.

The Barrett Company

New York, Chicago, Philadelphia
St. Louis, Minneapolis, Boston
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Buffalo, Columbus, Milwaukee
Providence, Syracuse, Cincinnati
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THE BARRETT COMPANY, Ltd.
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Tarvia "RE-TREAD"

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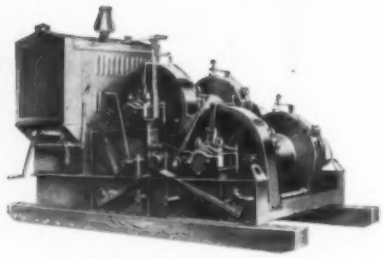


The New Clyde Hoist

Internal Expanding Band Friction Hoists

ONE of the latest developments in hoisting equipment, recently brought out by the Clyde Iron Works Sales Co., Duluth, Minn., is an internal expanding band friction hoist. These hoists are particularly adapted for work where high line speed is required.

The outstanding feature of the new hoist is the internal expanding band friction which is self-energizing but which still retains the "feel" of the frictions so necessary for successful operation. Other special features include double brake bands which are all interchangeable, air-cooled brake flanges, and roller bearing drums.

A Larger Series of Six-Cylinder Heavy-Duty Engines

IN step with modern developments, an additional line of heavy-duty 6-cylinder engines, of the L-head type, has been announced by the Hercules Motors Corp., Canton, Ohio.

This series, known as the "HX," is produced in five different sizes; the HXA, 4¾ by 6 inches, with a displacement of 638 cubic inches; the HXB, 5 by 6 inches with a displacement of 707 cubic inches; the HXC, 5¼ by 6 inches with a displacement of 770 cubic inches; the HXD, 5½ by 6 inches with a displacement of 885 cubic inches; and the HXE, 5¾ by 6 inches with a displacement of 935 cubic inches.

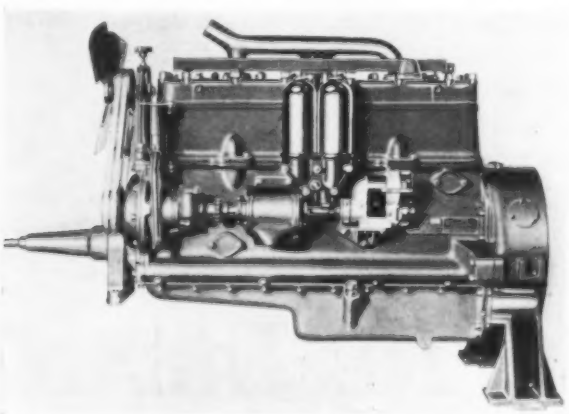
All engines in this series are identical in design and alike as to outside or installation measurements. They differ only in the bore and such parts as are thereby affected.

The crankcase, designed to provide unusual rigidity, is cast separately from the cylinders. It is supplied in either aluminum or grey iron, depending upon the service for which the engine is intended. To further provide for needed rigidity, sixteen through-bolts are used to secure the cylinders to the crankcase. The crankcase is supported on seven main bearings, as are all Hercules 6-cylinder engines. The main bearings are 3½ inches in diameter, the total projected areas of the seven main bearings being 58 3/16 square inches.

The connecting rods in these engines are of a unique yet thoroughly proved design wherein the connecting rod bolts, which secure the caps to the rod, are forged integrally with the rod. This design puts the clamping action much closer to the bearing edge than is the case where rods are drilled and separate bolts are used. In addition this design assures extreme strength since the rod is not weakened by the usual drilling and milling for the bolt and head.

The cylinders are cast in pairs of three, the heads are removable and so designed as to accommodate two sets of spark plugs where double ignition is desired. The lubricating system consists of a full-pressure type, gear-driven oil pump of large capacity, with a double scavenging pump arrangement which assures proper circulation of the lubricant. An oil purifier mounting is provided, likewise consideration has been given to effective air cleaners. A fuel pump drive is also provided and an auxiliary V-belt drive for large-size generators.

The water pump is of large capacity delivering 135 gallons per minute at 2,000 rpm. Either downdraft or updraft manifolds are offered for the HX series. Exhaust manifolds of the center or rear outlet types are likewise supplied with the exhaust either upward or downward, to best meet the installation needs.



Accessory Side of the Hercules HX Series Six-Cylinder Engine for Industrial Application

The New Speeder ⅜-Yard Convertible Shovel

A New Three-Eighths-Yard Capacity Full Revolving Shovel

A ⅜-yard excavator which is fully convertible has been announced by the Speeder Machinery Corp., 1201 South Sixth St., Cedar Rapids, Iowa. This new machine incorporates all the features of the Speeder ½-yard shovel. It has a 14-foot boom and 10-foot dipper stick as standard equipment and is powered with a 40-horsepower, 4-cylinder motor. The shovel boom may be removed and either a 22, 24 or 26-foot boom for crane or dragline operation may be attached. Either a pull-shovel or a skimmer-scoop may also be used.

The shovel is equipped with electric lights and starter as standard equipment, optional two or four-speed transmission, a fully enclosed cab, and the Speeder patented cable crowd. It is capable of making five complete swing revolutions per minute and travels at the rate of 3 miles per hour. It has a 14-inch tread shoe, a very short tail swing, interchangeable truck mounting, is 7 feet overall width, and weighs 10 tons. All gears are enclosed in and run in grease.

The Speeder Corporation is now in full production of this new model, giving this company a range of machines from ⅜ through ½ to 1¼-yards capacity.

BETTER THAN EVER

A SUPER OIL, TAR and ASPHALT DISTRIBUTOR

— *for* Etnyre OREGON ILL. 1931 —

That is what
STATE OFFICIALS, COUNTY OFFICIALS and CONTRACTORS
will find embodied in the 1931

"ETNYRE MODEL F"

Designed and built to maintain and produce the best kind of BITUMINOUS ROADS by applying the material in just the right amount at the proper temperature.

This is an actual photograph of an "ETNYRE MODEL F" applying 7/10 gallons per square yard, asphalt heated to 340 degrees F. with 18' spray bars on the Sanford-Orlando Road No. 3 in Florida. This is a splendid example of

"ETNYRE FULL WIDTH DISTRIBUTION"

The first application of 2 gallons per square yard was also applied with 18' spray bars.

Let us send you bulletin No. 503 giving specifications and more interesting facts.

Manufactured by

E. D. ETNYRE & COMPANY
Oregon, Illinois

SALES OFFICES IN PRINCIPAL CITIES

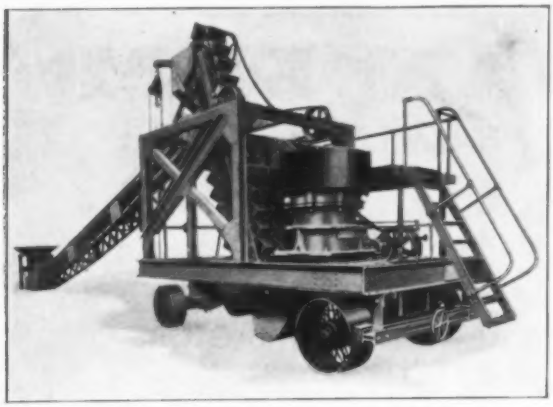
LONG SERVICE—LOW UPKEEP

SUPERIOR LOCK ROAD FORM

In figuring your form costs, it is the cost per mile of road built that interests you. Heltzel Form costs are extremely low because Heltzel Superior Lock Road Forms are built to last. Wide tread, double-flanged base, larger-diameter stakes, and heavy rivets —none of which are in tension— give assurance that an unusually large mileage of concrete road can be built at low cost with these Forms.

Write for complete information about Heltzel Weighing Plants, Straight Edges, Traveling Bridges, Trail Graders, Subgrade Testers or Curb and Gutter Forms.

THE HELTZEL STEEL FORM & IRON CO. WARREN, OHIO



The Smith Engineering Works Portable Crushing Plant with Gyratory Crusher

A Portable Crushing and Screening Plant with Gyratory Crusher

A PORTABLE self-contained crushing and screening plant of rugged and substantial design and equipped with a gyratory crusher has been developed by the Smith Engineering Works, Milwaukee, Wis. This plant will deliver two accurately sized products such as sand and less-than-1-inch size rock when equipped with a No. 32 reduction crusher, or sand and less-than-1½-inch size rock when equipped with a 6-A or 8-A crusher. As the crusher is in a closed circuit with the screen, there is no oversize.

The standard plant consists of six units. Unit 1 is a 4-foot 2-inch wide by 5-foot long steel receiving hopper with a steel supporting frame. This is equipped with a 20 by 40-inch reciprocating plate feeder and a 16 by 18-inch quadrant gate to regulate the flow of material to the feed conveyor. The feeder is driven from the conveyor foot shaft by a chain drive. Angles with holes are provided around the top of the hopper for attaching a platform or ramp so that a slip scraper, drag scraper, small trucks or any other means may be used to charge the hopper.

The second unit is a 20-inch by 40-foot steel frame feed conveyor provided with a 2-wheel truck for moving it. This is driven by the main plant through a belt drive with a clutch pulley.

The third unit is the screening and crushing plant, all mounted on heavy 4-wheeled trucks and consisting of a 3-foot by 8-foot double-deck vibrating screen, a gyratory crusher of variable size, a heavy chain elevator for returning the crushed product to the screen, drives for the feed conveyor, screen, elevator and finished product conveyor, a 1½-cubic yard sand hopper under the screen, a jib crane for raising and lowering the feed conveyors, and an operators' platform of steel with a steel hand rail and stairway. No power plant is included, but the crusher countershaft is provided with a 30-inch diameter by 12-inch face pulley for taking the drive from any suitable power plant.

The fourth unit is a 16-inch by 45-foot steel frame finished product conveyor which handles the material, usually sand, which passes through the bottom deck of the vibrating screen. It is driven by belt drive from the main power plant. A 16-inch by 45-foot steel frame finished product conveyor for handling the gravel which passes from the top deck of the vibrating screen and is rejected by the bottom deck is the fifth unit of this plant. It is driven direct from the sand conveyor by a coupling. The 2-wheel truck furnished ished product conveyors.

The sixth unit of the plant is a 20-cubic yard capacity two-compartment all-steel storage bin equipped with jib cranes. The cranes furnished with the plant can be inserted in sockets provided on this bin and used to raise and lower the finished product conveyors. This bin can be moved on a truck.

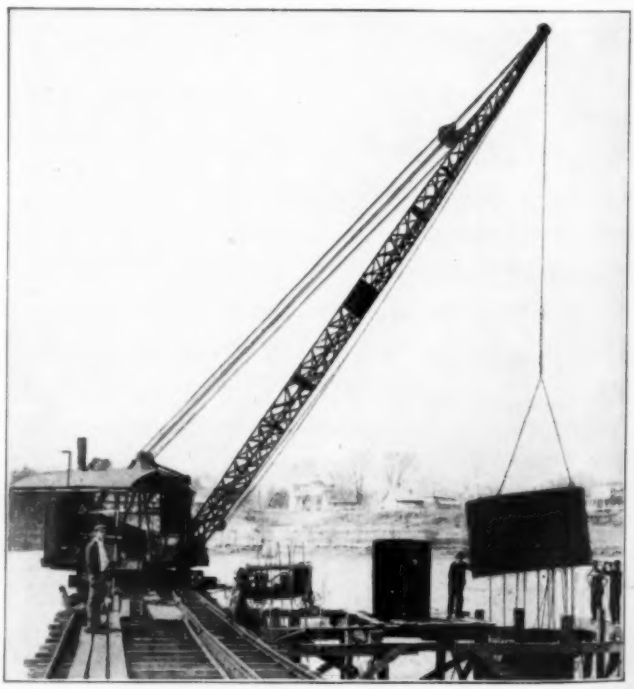
In clean sand and gravel, the capacity of the plant, when making two products, is from 30 to 40 tons per hours. When sand is mixed with gravel, making only one final product, the plant produces from 40 to 50 tons per hour, depending upon the final size wanted.

A Full-Revolving Derrick

A REVOLVING derrick designed to perform all the operations of a locomotive crane, except switching cars, but which because of its light weight, long reach and broad gage, is especially adapted to any work which must be done from a trestle, is manufactured by the Lakeside Bridge & Steel Co., 200 Villard Ave., Milwaukee, Wis. This derrick is helpful in pile driving or pulling, clamshell or dragline work, placing pneumatic caissons, erecting structural steel and all similar work. The construction of the derrick also makes it adaptable for barge mounting.

The derrick consists of a boom, head frame, steam slewing engine, water tank and fully enclosed cab mounted on a turntable frame. This frame, in turn, is mounted on a 21-foot sub-base provided with a king pin and roller path and supported by four double flanged wheels or may be furnished with skids. The hoisting unit, which may be a 2 or 3-drum engine, is furnished by the purchaser unless ordered with the derrick. The turntable frame and sub-base are constructed of rolled structural steel beam sections and plates, electrically welded throughout, thoroughly braced and of ample strength to withstand the most severe working stresses. The boom is of the latticed angle type, spliced to accommodate additional center sections where extra length is required.

Lakeside revolving derricks are steam operated at 125 pounds working pressure. They are designed for working equally well with a low or high boom.

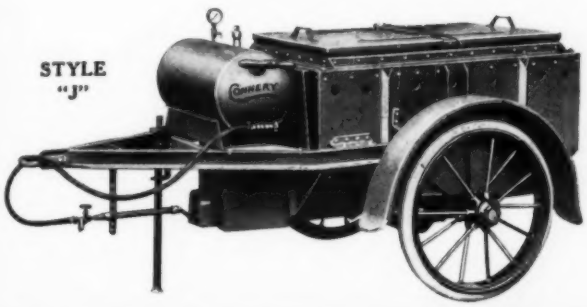


The Lakeside Full-Revolving Derrick

CONNERY'S

Oil-Burning Tar and Asphalt Heaters

STYLE "J"



STYLE "J" oil-burning tar and asphalt heating kettle is designed for highway maintenance work and the roofing contractor. Of compact, improved modern design. It is sturdily made to withstand continuous and severe service. Burns kerosene, coal, oil or light furnace oil. Offered in five sizes: 60, 85, 110, 165 and 200 gallons capacities. Rubber-tired wheels (optional equipment)—steel wheels with rollerbearings, standard equipment.

Send for our little "Blue Book" illustrating our many specials in Tar and Asphalt Heaters, Oil-Burning Heaters, Oil Burners, Pouring Pots, Hand Spraying Attachments, Fire Wagons, Tool Heaters, etc.

CONNERY & CO., Inc.
4000 N. Second Street
PHILADELPHIA, PA.

CONWEIGH ROLLROUND CONVEYOR

Especially Built for Concrete from Mixer to Forms

Wheels set for longitudinal movement

A wheeled-type belt-conveyor unit having adjustment features for conveyor and wheels that give a wide range of application for handling all materials. The conveyor boom has an automatic safety-lock on elevating mast.

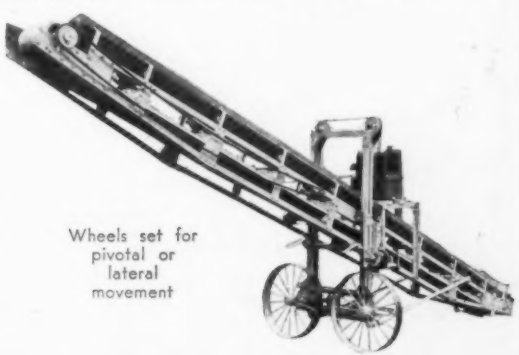
Wheels have a swivel adjustment allowing a pivotal, lateral or longitudinal movement of the loader.

Belt troughing and return idlers and the foot-supporting roller have protected ball-bearings with Hyatt bearings in wheels.

Raising or lowering easily made by self-locking worm and worm-gear winch.

Loader sizes range from 18 to 30 feet lengths with belts 16 to 24 inches wide, for 40 to 150 cu. yds. per hour capacity.

Either electric motor or gasoline engine will be supplied as desired.



Wheels set for pivotal or lateral movement

THE CONVEYING WEIGHER CO., 90 West St., New York, N. Y.

A New Model Full-Revolving, Convertible, Full-Crawler Power Shovel

The New Full-Revolving Bay City Power Shovel

AN addition to the line of Bay City shovels made by Bay City Shovels, Inc., Bay City, Mich., is announced in the new Model S, a full-revolving convertible, power shovel with full-crawler mounting and enclosed steel cab with gasoline oil engine or electric power. The machine weighs 63,000 pounds equipped as a shovel. It is rated as a full 1-yard shovel or excavator or a 17-ton crane operating at a 12-foot radius.

The Model S machine is furnished with shovel, dragline, trench hoe, clamshell, or crane boom attachments, all of which are convertible. It closely follows the design of the Model R, ¾-yard machine with an exceptionally large diameter center pin and swing circle, cast car body and machinery table, frictionless ball or roller bearings for all machinery shafting, special analysis steel shafting, high pressure lubrication for all parts, machine cut or forged and hardened steel gears, E-Z lever control, fast operating speeds and wide clutch surfaces.

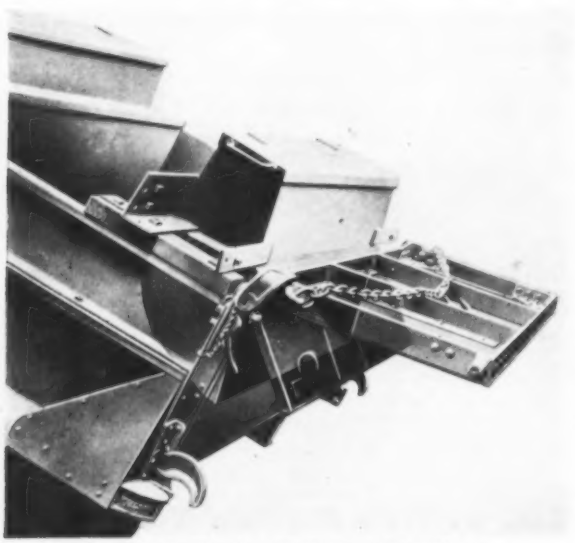
The 1-yard shovel is powered by a Climax Blue-Streak 6-inch bore and 7-inch stroke gasoline engine. The shovel boom is 21 feet long with a chain crowd and cast manganese dipper. Crane booms are furnished from 35 to 60 feet in length. The crawler tread width is 22 inches and the complete shovel can be shipped without dismantling.

A Cement Container for Batch Trucks

A STEEL cement container for batch trucks used on highway paving or other work where the cement is proportioned into compartment trucks at a central plant, and then hauled to the paver or mixer has been announced by the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Penna., under the title Blaw-Knox Cementank.

This box is of welded steel construction, moistureproof and equipped with a hinged top cover and a discharge door which opens automatically when the compartment is dumped. The Cementank requires no attention on the part of the operator as the cement is dumped by gravity and flows with the aggregate into the skip of the mixer. Arching of the cement is prevented by the shape of the tank and its method of discharge.

The discharge door is flashed with felt to prevent leakage of the cement. When the end plate or truck partition is locked, it automatically locks the discharge door of the Cementank. This container has a capacity of 10.35 cubic feet which is ample to take care of the cement for a 7-bag batch.



A Cementank Showing Method of Mounting in a Batch Truck Compartment

A New Line of Steel Mules

THE new Marion Mule made by Marion Mules, Inc., Marion, Ohio, is equipped with either steel wheels, crawlers, or pneumatic tires which may be used and interchanged in the field without difficulty. The crawler tracks are Marion designed and built, having a driving sprocket operating on Timken bearings.

The New Marion Mule

The power unit is a McCormick-Deering Model 10-20 industrial tractor which has four speeds forward and one reverse. The power unit is mounted complete in a heavily constructed chassis frame having 7-inch side channels. The front axle is of Marion design, full-floating and oscillating as shown in the illustration. The tractor drive axle does not carry the load. An auxiliary or dead axle in the rear is fixed to the chassis, supporting the load and driving wheels. The tractor drive axle connects with the dead axle through a gear reduction of 3 to 5, thus increasing the power of the unit by 50 per cent.

The body is of 4-cubic yard capacity and may be increased to 5 cubic yards with sideboards. The body is gravity-operated and when in a lowered position may be easily used to bulldoze the load. The spark and throttle controls are located on a steering wheel. A Ross heavy duty steering gear having a 20 to 1 ratio is used.

All of the machine parts of the chassis are of alloy steel or forgings, reinforced and ribbed to stand heavy going. With crawler tracks the Marion Mule has a speed of 6 miles per hour, with steel wheels, 9 miles per hour and with pneumatic tires, 12 miles per hour.

simplifies CURING practice

CALCIUM CHLORIDE CURING

Saves Time, Labor and Materials

The common method of curing with straw or earth requires constant sprinkling and repeated inspections. Considerable labor, both in supplying and disposing of the dirt and straw add to the cost of this method.

The modern Calcium Chloride method greatly simplifies the curing process and saves considerable labor and material expense.

Spread Calcium Chloride immediately after removal of the wet burlap and the whole job is done. Curing is uniform. High early strength is attained. High permanent strength is assured.

The spreading of the Calcium Chloride takes but a few hours of one man's time as contrasted with the greater labor involved in the dirt or straw and sprinkling method.

Calcium Chloride curing has been approved by the Bureau of Public Roads after thorough tests. Interesting booklets describing this efficient method of curing are issued by the member companies listed below. Send the coupon.

Calcium Chloride Publicity Committee

FLAKE
CALCIUM CHLORIDE
"develops high early strength concrete"

Send this coupon to any one of these member companies:

Solvay Sales Corporation, 61 Broadway, N. Y. City
The Columbia Products Company, Barberton, Ohio
The Dow Chemical Company, Midland, Michigan

Without obligation please send booklets on Calcium Chloride concrete curing practice.

Name _____

Position _____

Address _____

CG-EM 2-31

The New Hercules Rotary-Type Dump Body

A Rotary Power Steel Dump Body for Trucks

A NEW steel dump body which is operated by power and built in 1, 1½ and 2½-cubic yard capacities has been announced by Hercules Products Corp., Evansville, Ind. This rotary power dump body is fast in operation, has a low loading height, is simple to operate and rests easily on the chassis. It has an audible indicator for the throw-out.

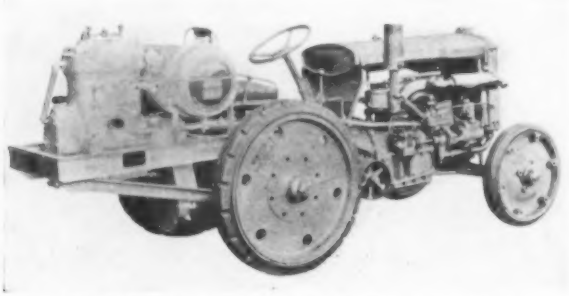
The body is made of 10-gage sheet steel, is of one-piece construction, heavily reinforced with angles, channels, and tie rods, and is electrically-welded throughout. The body can be raised or lowered smoothly and quietly in about 8 seconds. It has dual control and can be stopped at any angle going up or coming down by the power take-off lever or the main clutch. The body mounts close to the seat or the cab conserving every inch of space on the chassis. It has a positive lock when in hauling position which prevents pounding on the subframe or body shifting on the chassis.

The rotary hoist is not affected by cold weather. It gives an available dumping angle of 45 degrees with ample tail-gate clearance. The tail-gate is automatic, and also may be controlled from the cab where all controls are assembled.

These rotary power bodies are available in various styles and capacities at only slightly higher prices than hand hoist and automatic dump bodies, according to the announcement of the manufacturer.

A Tractor-Mounted Air Compressor

A COMBINED tractor and air compressor in which the compressor does not interfere in any way with the general utility of the tractor has been announced by Metalweld, Inc., 26th and Hunting Park Avenue, Philadelphia, Pa. The tractor, an Allis-Chalmers Model U industrial unit, is guaranteed to puil 3,000 pounds in low gear and 2,500 pounds in second gear. It has 3 speeds forward, and one reverse.



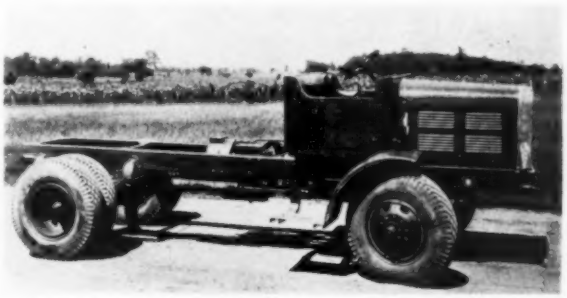
The New Metalweld 110-Cubic Foot Capacity Tractor-Mounted Compressor

The compressor has a displacement of 110 cubic feet of free air per minute, and is designed to operate at 100 pounds continuous pressure. This capacity will take care of one rock drill, two paving breakers, three trench spades, three riveting hammers or two backfill tampers.

Two New Four-Wheel-Driven Trucks Announced

A 5-TON and a 7½-ton capacity four-wheel-driven truck known as M5 and M7, respectively, have been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. Both trucks have wheel bases of 165 inches, with a loading space of 156 inches behind the cab and 72 inches tread, and frames with an overall width of 34 inches. Both frames are of heat-treated high carbon pressed channel steel, the chassis weighing 11,000 pounds plus body weight allowance of 2,500 pounds and 13,000 and 3,000 pounds, respectively.

Each truck has a 6-cylinder motor, developing for the 5-ton, 102 brake horsepower at 2,000 rpm and for the 7½-ton truck 127 brake horsepower at 1,700 rpm. The cylinders in both motors are of the removable cast-in-pairs, truncated, detachable-head design. The crankshafts have seven bearings and are hung in exceptionally deep, rigid, girder type crankcases.



Chassis of the New Model M7 FWD 7½-Ton Truck

The selective sliding gears, four-speed, main transmission in each is supplemented by a planetary, two-speed auxiliary transmission, which gives, in combination, a range of 8 forward and 2 reverse speeds with direct drive in the eighth. The outstanding features of the new FWD planetary step-down gear is that it permits the use of a 12-inch silent drive chain instead of a series of gears.

To provide ample road clearance, 12 inches and 15 inches, respectively, and further to provide ample safety factors to withstand the enormous torque of the motor in the lower gear ratios, full-floating, double-reduction axles are used, the first reduction through a pair of bevel gears, the second reduction through spur gears. All gears are enclosed and protected from grit and dust and run in a bath of oil.

The new patented steering arrangement of the front axle makes for steering ease. The entire front-axle load is carried on two tapered roller bearings at each axle end, designated as trunnion bearings. They are tightly encased by positive oil seals which retain the lubricants and prevent the intrusion of water and grit. The bearings are lubricated through grease fittings.

The center differential, which compensates for the difference, under certain conditions, in the rotation between the front and rear axle shafts, is interposed between the front and rear propeller shafts. It is of the standard four-pinion bevel gear type with a jaw clutch on the hub of the differential case. When the operating clutch on the front jack shaft is engaged with jaw clutch of the differential case, all center differential action is eliminated. The locking clutch is worked through a pedal near the clutch pedal in the cab.

Culvert Theory vs. Practical Problems

THEORY shows on paper how long a culvert *should* last. But when the culvert goes into the ground where it must combat the destructive forces of soil, water, weather, erosion and shifting earth, it is then that nature upsets the best theories in the world.

On the evidence of twenty years service in the ground, we find that GOHI Corrugated Culverts successfully solve all the practical problems that arise in modern road drainage.

They are the simplest and easiest type to install and, when in the ground, are free from weaknesses that frequently develop with other types. Because of their flexibility, freezing water, settling fills, or the vibration of traffic, can't crack them. Neither will they break, nor will the joints pull apart because of movement of earth due to frost action.

GOHI durability is a fully demonstrated fact. Culverts that have been giving 100% service for more than 20 years are practically perfect today, due to the rust-resisting qualities of the *pure iron-copper alloy* base metal from which they are fabricated.

The deeper you go into the culvert proposition, the stronger will become your conviction that GOHI Corrugated Culverts best meet practical conditions and give lowest-cost-per-year service.

Write today to any one of the GOHI Fabricators below. He will give you complete details and technical service on any installation.

Specify GOHI Culverts by name

GENUINE OPEN HEARTH IRON GOHI PURE IRON - COPPER ALLOY

Corrugated Culverts

Guaranteed 99.90% Pure Iron-Copper Alloy

GOHI CULVERT MANUFACTURERS, Inc.
NEWPORT, KY.

Lincoln Steel and Forge Co.
St. Louis, Mo.

The Newport Culvert Co.
Newport, Ky.

The Pennsylvania Culvert Co.
Philadelphia, Pa.

Denver Steel & Iron Works Co.
Denver, Colo.

A. N. Eaton, Metal Products
Omaha, Nebr.

Feenaughty Machinery Co.
Portland, Oregon

Tennison Brothers
Texarkana, Ark.

Capital City Culvert Co.
Madison, Wis.

Central Culvert Co.
Ottumwa, Iowa

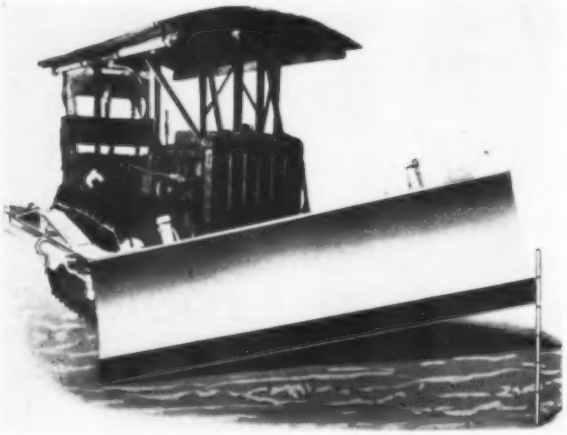
Roanoke Sales Corp.
Roanoke, Va.

St. Paul Corrugating Co.
St. Paul, Minn.

Tennison Brothers
Oklahoma City, Okla.

Left—A Practical Problem Solved: Replacing rigid type with GOHI Corrugated Culvert, on Dixie Highway, north of Falmouth, Ky. (GOHI Culverts meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

©1931, G. C. M., Inc.



The New LaPlant-Choate Backfiller, Showing Its Flexibility

A Combination Backfiller and Blade Plow

A BACKFILLER with hydraulic control and center pivot mounting has been developed by the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Ia. This company has made a backfiller for use on Caterpillar tractors and has developed in the new unit a number of outstanding improvements.

The backfiller has a newly designed plate pivot box which allows the blade to oscillate freely at all times, giving a full floating blade. The blade is shorter, which lessens the gap between those jobs where it was previously a question as to whether a bulldozer or a backfiller would be the better tool. It has chain adjustments which are used to hold either end of the blade down, even to having the lower end held down to cut approximately 20 inches below the track level.

A moldboard has been designed with an improved roll which enables the blade to cut in with a slicing action when set at an angle, rolling the material to the side with the least effort. This same roll is also much better for carrying the load when the blade is set squarely in front for bulldozing work. The advantageous principle of an overhanging blade on the delivery side for counteracting the side draft is another important feature. This allows the tractor to remain on safe ground while delivery is being made over a bank or into a ditch.

New improvements permit the blade to have 10 inches clearance from the ground when the blade is set at an angle and 12 inches when it is set for bulldozing work. A new special side wing has been developed for use where the soil is subject to cave-ins. The short side blade can also be used to good advantage at the forward end for use as a land side bumper blade to minimize the tendency of the blade to draw in too deeply.

Although the ground is rough and uneven, the blade will carry level on the mushroom shoe even when the tractor is running in ruts. These shoes are adjustable and ride on the smooth level ground in the rear of the blade, and when a smooth cut is once started it can be maintained with comparative ease. The close proximity of the blade to the front of the tractor makes it possible to utilize its full power.

Hydraulic control which enables the tractor driver to raise and lower the blade instantly is essential to any successful backfiller. The hydraulic system of this machine is furnished through an oil pump which is driven by the power take-off shaft of the tractor. The gears run in oil constantly and the bearings are automatically oiled under pressure, and are not subjected to any amount of wear. The pump is provided with an automatic bypass safety valve which releases itself at 350 pounds pressure.

The center pivot mounting makes it possible to put the entire weight of the backfiller on the tractor when desired, thus making it instantly portable. The weight of the backfiller also increases the traction of the tractor in hard work. The backfiller frame surrounds the tractor while the side frames are attached to the tractor by means of an oscillating sub-axle carried on the center of the track frame of the tractor. The center of the track frame is the point least effected by the rise and fall of the tractor. Consequently, the push point remains relatively constant, allowing the blade to maintain its proper working level through gravity, assuring a level grade and an even cut. Adjustable shoes prevent digging in.

A New Method of Welding

A NEW method of oxy-acetylene welding known as the Lindeweld process has been introduced by the Linde Air Products Co., 30 East 42nd St., New York City. The process is used at present for the welding of pipe but future developments are expected to lead to its application in many other industrial welding operations. In welding of pipe for oil and gas transmission, the Lindeweld process has resulted in savings from 30 to 60 per cent of the time required to make a weld by the methods previously employed, depending upon the size of the pipe. Oxygen and acetylene consumption have also been reduced considerably.

Consistently higher strength welds are obtainable than by other welding processes so there is no sacrifice of quality for the benefit of the increased speed. In tensile tests made in the field on specimens welded by this process, the welds have invariably outpulled the pipe. Good ductility has also been shown in bend tests.

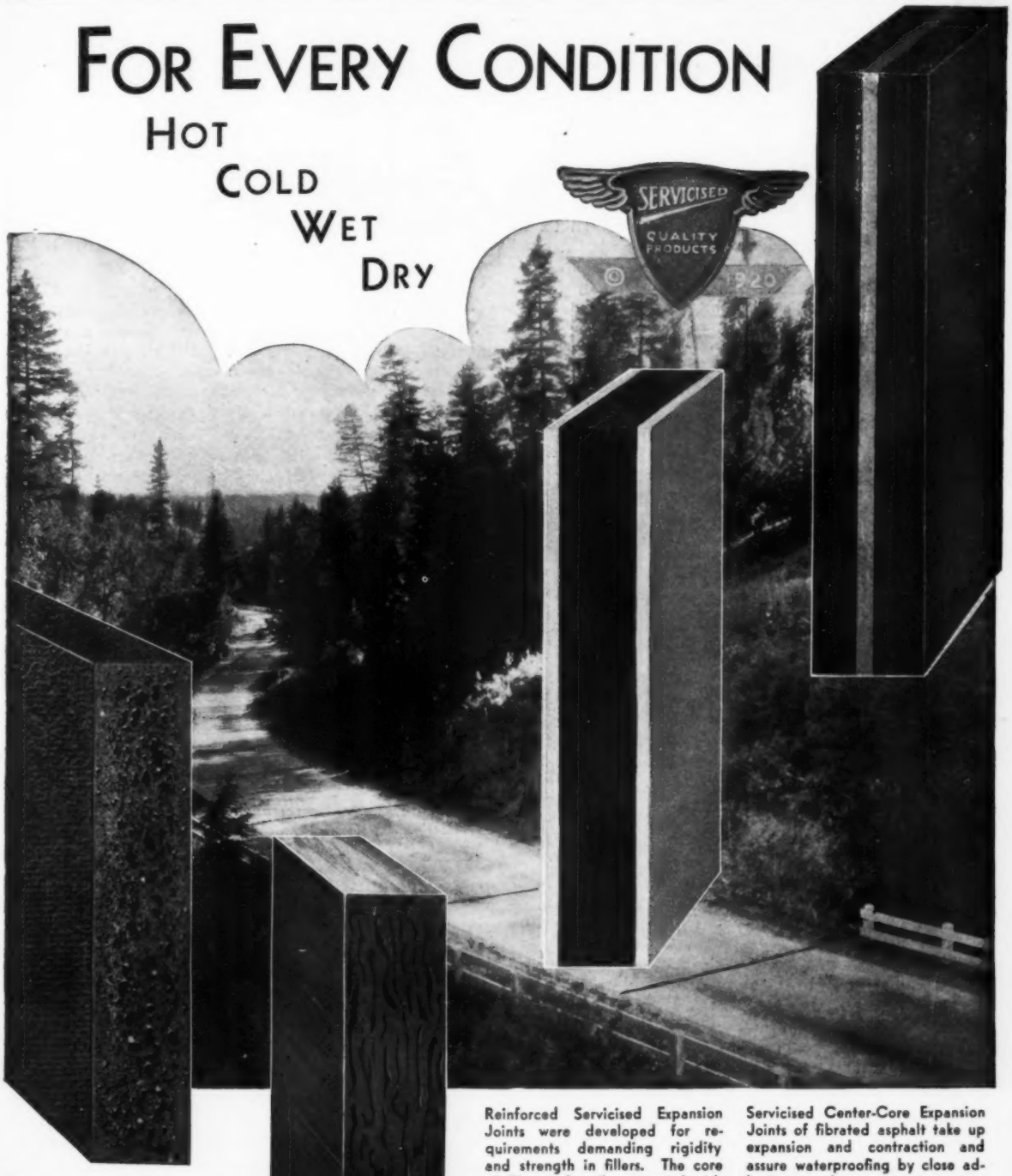
The Lindeweld process is the result of years of laboratory research and field testing. It depends essentially on a new method of blowpipe manipulation and upon the use of a new welding rod introduced for that purpose, known as Oxweld No. 24 Lindeweld Process Welding Rod. Experienced welders can easily adapt themselves to the new method.

This has passed the experimental stage, as more than 300 miles of high pressure pipe line welded by this process are now in the ground.

Cold Bend Made on a 20-Inch Diameter Pipe Line Welded by the Lindeweld Process

FOR EVERY CONDITION

HOT
COLD
WET
DRY



The Servicised Sponge Rubber Expansion Joint is the most perfect protection from severe water conditions and extreme heat.
A non-oozing super-elastic joint material—impervious to water.

Type "B" Servicised Expansion Joints are of special quality asphalt and selected fibres—very low in moisture absorption—maximum elasticity and plasticity—minimum of oozing—long life and resistant to traffic wear.

Reinforced Servicised Expansion Joints were developed for requirements demanding rigidity and strength in fillers. The core of fiber is heavily saturated with high quality asphalt and reinforced on the sides by sheets of saturated felt—a quality joint for certain conditions.

Servicised Center-Core Expansion Joints of fibrated asphalt take up expansion and contraction and assure waterproofing by close adhesion to the pavement proper. The fiber center core reinforces and furnishes elasticity while the fibrated asphalt sides guarantee adhesion to the pavement slab.

Write us of your conditions and get our recommendations.

SERVICISED PREMOULDED PRODUCTS, INC.

GENERAL DISTRIBUTORS For Products Manufactured by

SERVICISED PRODUCTS CORPORATION

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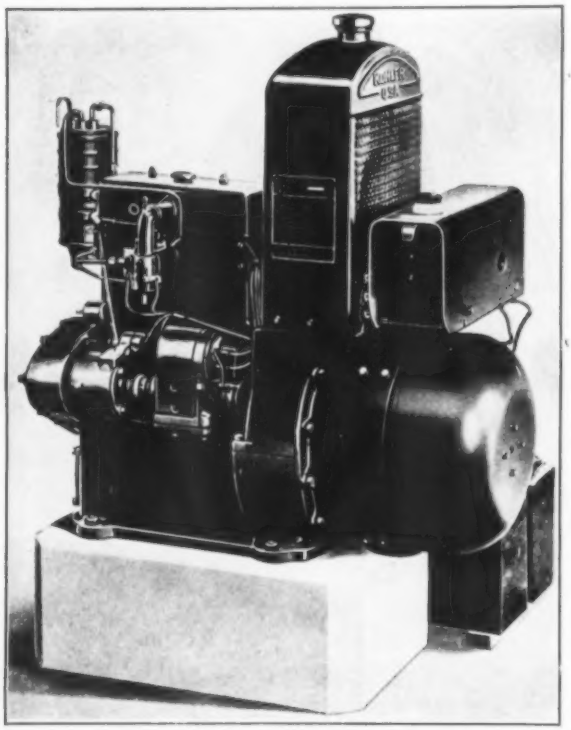
A New Double Duty Portable Electric Plant

A NEW electric plant which furnishes a combination service, namely current for a number of lights from the battery, and power for heavy duty from the generator after the plant has been started automatically, is announced by the Kohler Co., Kohler, Wis., in the Model D-32 Kohler electric plant.

This new power unit meets special needs on construction work, railroads, and in camps. Its service provides that a few lights can remain burning for long periods without starting the plant. From seven to twelve 25-watt lamps can be turned on and still current is delivered economically from a small two-tray rubber cell 32-volt battery.



The D-32 Kohler Electric Plant

When the demand reaches 300 watts, however, the plant automatically starts, the load is shifted from the battery to the plant and current goes directly from the generator to the line. When the load is reduced to approximately 200 watts, the engine stops and current for the lights again is taken from the battery. The entire operation is automatic and the battery is charged automatically.

This new plant has a capacity of 1½ kw. With the engine running it operates motors up to 2 horsepower. Heavy current consuming devices can be used, with current for lights to spare.

A New Ditcher for Small Trenches

THE great amount of hand work required in digging ditches for laying small pipes brought about the development of the Little Goldigger by the C. H. & E. Division of the National Equipment Corp., 30th Street and Concordia Avenue, Milwaukee, Wis. This ditcher, only waist high, not only digs the ditch faster than hand work, but removes a comparatively small amount of dirt because of the narrow trench, thus reducing backfilling.

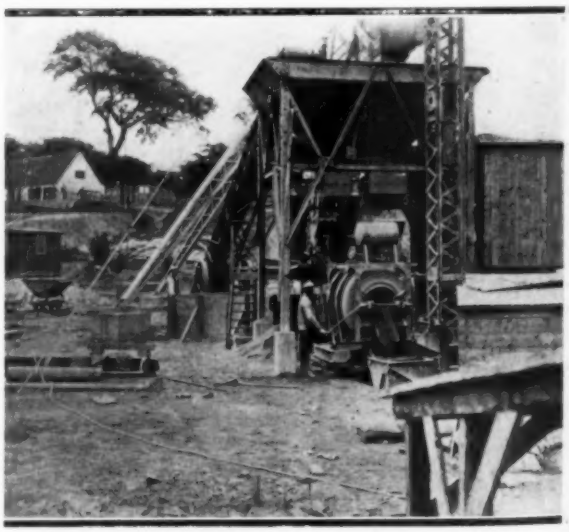
The New C H & E Little Goldigger

The C H & E Goldigger is designed and developed to dig a trench from 3 inches to 6 inches wide for gas service connections, high pressure gas lines, small oil pipe lines, ornamental lighting cables, telephone cables, sprinkling and drain pipes in golf grounds and airports, and in any other underground work that requires a trench up to 6 inches in width and 48 inches in depth.

The digging speeds vary from 1 to 6 feet per minute. Two speeds are available without changing sprockets and 36 speeds may be had by changing sprockets. Full multiplane traction with very low ground pressure permits operation on wet soil without miring and on parkways without injury to the grass.

The operating levers have been centralized on one side of the machine for the convenience of the operator in keeping his machine digging to the best advantage at all times. It can be used in very small spaces and its narrow width will allow it to pass through places where the clearances are small.

Rugged construction has been well balanced throughout the machine. All parts are built for severe and continuous service, the gears and sprockets are of steel properly heat-treated, and the gears are enclosed in cases and run in oil. The oil in the main gear case is used for the hydraulic boom lift and is circulated back over the top of the gears in the case, giving them a continuous oil batch. A 4-cylinder, 12-horsepower engine provides power for all operations.



AMERICAN CONSTRUCTION EQUIPMENT IN SERVICE IN DENMARK

A 40-cubic yard, 2-compartment Butler bin with volumetric weighing batchers and a Koehring 14-S mixer which delivered concrete to a ½-yard Insley mast hoist on a bridge job which Monberg & Thorsen, Kobenhave were building for the Danish State Railroads

Making the first application of Standard Asphalt Road Oil.

Processing mate ial to secure a thorough mix.

After mixing thoroughly the material is spread to three inch thickness.

Completed roadway over which a few vehicles have passed, showing ironing effect of wheels.

A Low Cost Method of Paving and Maintaining Roads Used in Twenty States

THE building of roads by the mixed-in-place method, using road oil and aggregate, is no longer an experiment. This method has been successfully used in twenty states, and during 1930, Standard Asphalt Road Oil was used on many miles of road constructed by this method.

Of all low cost types of roads now being constructed, the mixed-in-place method develops the most miles of good all-year roads at a low cost and a low maintenance expense.

It will pay you to investigate this type of construction for your 1931 road building program. We will gladly inspect any particular road and advise as to the suitability of the mixed-in-place method.

STANDARD OIL COMPANY
(INDIANA)
910 South Michigan Avenue Chicago, Illinois
101

ASPHALTS FOR EVERY PURPOSE

A REAL SERVICE FOR OUR READERS

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

A CEMENT CONTAINER FOR BATCH TRUCKS

Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa., has announced the Cementank, a steel cement container for mounting on batch trucks used on highway paving or other work where the cement is proportioned into compartment trucks at a central plant and then hauled to the paver or mixer. The method of mounting and operation of the Cementank is described in literature which may be secured direct from the manufacturer.

A NEW 2¼-YARD DIESEL DRAGLINE AND SHOVEL

The Bucyrus-Erie Company has announced a new 52-B diesel shovel, dragline, clamshell, crane with extra crawler type mountings for operating with a low ground bearing pressure when it is required. Complete information and full particulars regarding this piece of excavating equipment may be secured from the Bucyrus-Erie Company, South Milwaukee, Wis.

A COMPRESSED AIR PIPELINE PAINTER

Bulletin No. 83-Y issued by the Sullivan Machinery Co., 814 Wrigley Building, Chicago, Ill., describes completely the new Sullivan GV compressed air pipeline painter which gives increased speed and economy, cutting the painting gang from 25 or 30 to 7 to 10 men.

A SMALL DITCHER FOR NARROW TRENCHES

An eight-page illustrated folder containing details and specifications of the C H & E Goldigger ditcher which digs trenches up to 6 inches in width and 48 inches in depth, may be secured from the National Equipment Corp., 30th St. and Concordia Ave., Milwaukee Wis.

A NEW ELECTRIC-DRIVEN OUTDOOR AIR COMPRESSOR

A new 2-stage, air-cooled, electric-driven air compressor that can be used in outdoor or exposed locations throughout the year, is described in the literature of the Ingersoll-Rand Co., 11 Broadway, New York City. This type TLC has a piston displacement of 155 cubic feet per minute and is designed for 100 pounds discharge pressure.

A NEW THREE-EIGHTHS YARD FULL REVOLVING SHOVEL

The Speeder Machinery Corporation, 1201 South Sixth St., West, Cedar Rapids, Iowa, has announced a new ⅜-yard full revolving shovel which is convertible for crane or dragline operation. The machine is capable of five complete swing revolutions per minute, has a travel speed of 3 miles per hour and has a 14-foot boom and 10-foot dipper stick as standard equipment. Complete information may be secured direct from the Speeder Machinery Corp.

TWO NEW FOUR-WHEEL-DRIVEN TRUCKS

Four Wheel Drive Auto Company, Clintonville, Wis., has announced two new models of four-wheel-driven trucks known as the M5 and the M7, having, respectively, 5 and 7½-ton capacity. Complete descriptions of these two super-trucks may be secured direct from the company at Clintonville, Wis.

A PORTABLE GENERATOR THAT FURNISHES FLICKERLESS LIGHTS

Bulletin E-1, issued by the United States Motors Corp., Oshkosh, Wis., describes the complete line of U. S. portable electric plants for use on construction jobs, furnishing steady flickerless light to the capacity of the various models.

DOUBLE DUTY PORTABLE ELECTRIC PLANT

The Kohler Co., Kohler, Wis., has announced a new model D-32 electric plant which provides a combination service, namely current for a number of lights from a battery, and power for heavy duty from the generator after the plant has been started automatically. Complete information may be secured direct from the Kohler Co.

A NEW EASIER WELDING PROCESS

A new method of oxy-acetylene welding, known as the Lindeweld process, has been introduced by the Linde Air Products Company, 30 East 42nd Street, New York, N. Y. It saves from 30 to 60 per cent of the time required to make a weld by methods previously employed, and results in reducing the consumption of oxygen and acetylene. The method is completely described in literature which may be secured from the Linde organization.

A NEW TRACTOR-MOUNTED AIR COMPRESSOR

Metalweld, Inc., 26th and Hunting Park Ave., Philadelphia, Pa., has announced the new M-W Air King Allis-Chalmers tractor-mounted compressor in 75-cubic foot displacement and 110-cubic foot displacement operating at 100 pounds continuous pressure. Complete information regarding this mobile unit may be secured from the manufacturer.

A FIRST AID CATALOG

Mine Safety Appliances Co., Braddock, Thomas & Meade Streets, Pittsburgh, Pa., has published a new First Aid Materials Catalog, No. FA-2, which lists the wide variety of first aid equipment including bandages, sterilizing agents, pulmotors, poison ivy and creosote burn treatments, etc. A copy of this catalog can be secured by contractors, direct from the manufacturer.

SIX-CYLINDER HEAVY-DUTY TRUCKS

Rugged, powerful and dependable six-cylinder, heavy-duty White trucks, which enable contractors to maintain maximum output in road construction and maintenance work, are described in detail in the latest bulletin of The White Co., Cleveland, Ohio.

A DRAGLINE DRUM UNIT FOR TRACTOR MOUNTING

The Pioneer Gravel Equipment Manufacturing Co., Minneapolis, Minn., will be pleased to send literature describing the Pioneer double-drum dragline unit, especially designed for attachment to a Caterpillar Sixty tractor. This unit of extra heavy construction is built for heavy dragline work and is equipped with roller bearings in the drum unit. Operating a 1¼-yard dragline bucket, it has a capacity from 400 to 750 cubic yards per ten-hour day.

CURING METHOD FOR BETTER WEARING SURFACES

An interesting illustrated booklet and details of the Hunt Process of curing concrete which produces a better wearing and more uniform surface may be secured by those interested from McEverlast, Inc., 111 West Seventh St., Los Angeles, Calif.

STARTING, LIGHTING AND IGNITION SYSTEMS

The Electric Auto-Lite Co., Toledo, Ohio, will be glad to send to those interested, complete information in regard to Auto-Lite starting, lighting and ignition systems for tractors, trucks and all types of heavy-duty engines.

VERTICAL AND UNDERBODY HYDRAULIC HOISTS

St.Paul Hydraulic Hoist Co., St. Paul, Minn., will be glad to send to those interested complete information in regard to St.Paul vertical and underbody hydraulic hoists for dump trucks which are economical and efficient.

POWER AND ECONOMY IN TRACTOR PERFORMANCE

Complete information regarding Monarch 35, 50 and 75 track-type tractors and the Model U wheel-type tractors which have ample power, operate economically and give a good performance, may be secured from the Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

MAKING BATCHING EASY

The ease with which Butler bins and weighing hoppers can be operated and the sturdiness of this equipment are well known among road builders. The Butler Bin Co., Waukesha, Wis., will be pleased to send catalogs to any contractors interested in improved bins and batching equipment.

KNOCKING THE HIGH SPOTS OFF THE CONCRETE

The Berg Hi-Way surfacer which quickly and economically removes high spots from portland cement concrete and asphaltic concrete roads that every square foot of the road may comply with the specifications, is described in the literature of the Concrete Surfacing Machinery Co., 4559 Spring Grove Ave., Cincinnati, Ohio.

A COMPLETE LINE OF PORTABLE AND STATIONARY COMPRESSORS

The Schramm line of compressors built by a company which has specialized in this work for 30 years and which includes both portable and stationary engine-driven units built in sizes that cover almost any requirement in the construction field, from the largest to the smallest job, is described with complete specifications in the literature of Schramm, Inc., West Chester, Pa.

EXCAVATORS FOR EVERY TYPE OF SERVICE

Bulletin 3012 issued by The General Excavator Co., Marion, Ohio, describes and illustrates the complete line of General excavators which are now using Hercules Type WXC-3 or the Buda Type BUS engines, both of which are rated at 62 horsepower at an operating speed of 1,350 rpm, which is the governed speed.

AN IMPROVED CAR PULLING UNIT

Bulletin No. 1128-RF, issued by The Webster and Weller Mfg. Cos., 1856 N. Kostner Ave., Chicago, Ill., contains a complete description of the Weller capstan car puller which is electrically-operated, self-contained, weatherproof and designed to pull cars, trucks, etc., at any angle.

A NEW ONE-YARD CONVERTIBLE POWER SHOVEL

Bay City Shovels, Inc., Bay City, Michigan, will be pleased to send complete information regarding the new Model S, full-revolving convertible power shovel with full-crawler mounting and enclosed steel cab, powered with a Climax gasoline engine.

A ROTARY POWER DUMP BODY

Hercules Products, Inc., Evansville, Ind., has announced a rotary power dump body, built of steel and made in 1, 1½ and 2½-cubic yard capacity. This body is described and pictured in detail in literature which may be secured from the manufacturer free on request.

A PORTABLE SCREENING AND CRUSHING PLANT

The new Telsmith portable crushing and screening plant equipped with a gyratory crusher is described in an illustrated folder which may be secured from the manufacturer, the Smith Engineering Works, Milwaukee, Wis.

A RUGGED SELF-PRIMING CENTRIFUGAL PUMP

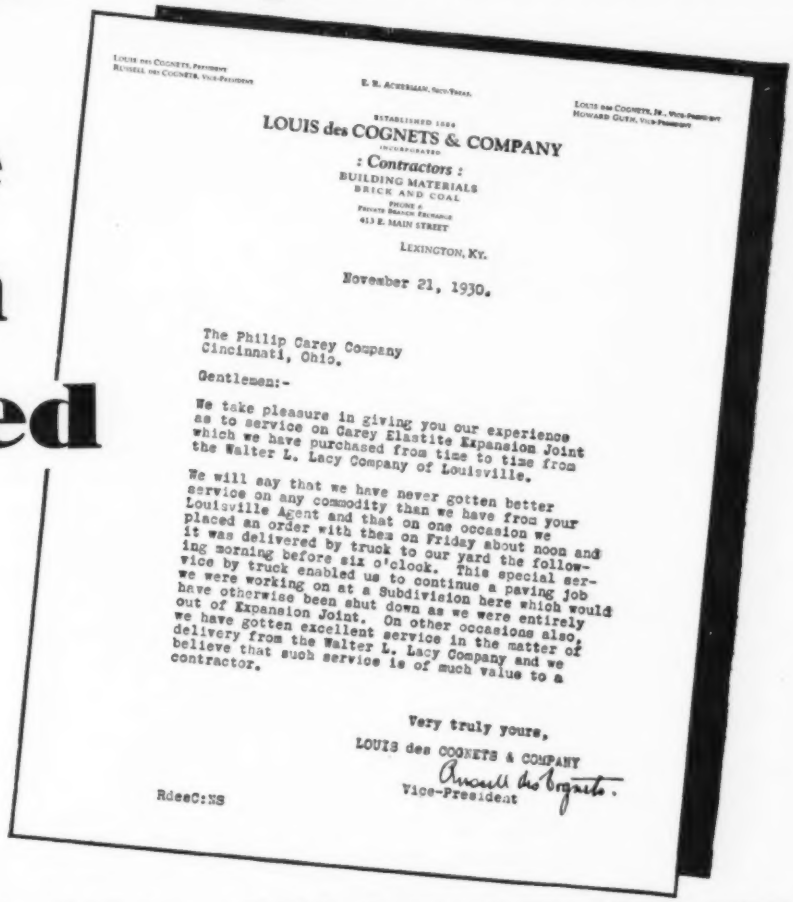
A new 2-inch Humdinger self-priming centrifugal pump made by Ralph B. Carter Co., 192 Atlantic St., Hackensack, N. J., in which the dependability has not been sacrificed to secure extreme light weight and which is capable of delivering 6,000 gallons per hour on most construction jobs, is described in literature which may be secured from the manufacturer.

Carey Elastite Expansion Joint

REG. U.S. PAT. OFF.

TRADE MARK REGD. U.S. PATENT OFFICE

—there when needed



LOUIS des COGNETS & COMPANY
INCORPORATED
: Contractors :
BUILDING MATERIALS
BRICK AND COAL
413 E. MAIN STREET

LEXINGTON, KY.

November 21, 1930.

The Philip Carey Company
Cincinnati, Ohio.

Gentlemen:-

We take pleasure in giving you our experience as to service on Carey Elastite Expansion Joint which we have purchased from time to time from the Walter L. Lacy Company of Louisville.

We will say that we have never gotten better service on any commodity than we have from your Louisville Agent and that on one occasion we placed an order with them on Friday about noon and it was delivered by truck to our yard the following morning before six o'clock. This special service by truck enabled us to continue a paving job we were working on at a Subdivision here which would have otherwise been shut down as we were entirely out of Expansion Joint. On other occasions also, we have gotten excellent service in the matter of delivery from the Walter L. Lacy Company and we believe that such service is of much value to a contractor.

Very truly yours,
LOUIS des COGNETS & COMPANY
Vice-President

RdesC:HS

When the pavement is ready to pour, the Expansion Joint *must* be on the job. For almost 20 years Carey has been giving dependable service to road builders. Stocks of Carey Elastite Expansion Joint - - the felt side joint - - are carried in all shipping centers; and any order can be delivered without delay.

If you have not ordered Elastite for your Spring requirements, we suggest you do so. Write for 1931 price list and trade discounts.

THE PHILIP CAREY COMPANY x Lockland, Cincinnati, Ohio
Branches in Principal Cities

BUILT-UP ROOFS
ASPHALT PRODUCTS
ELASTITE EXPANSION JOINT
WATERPROOFINGS
ROOF PAINTS

Carey PRODUCTS

HEAT INSULATIONS
ASBESTOS MATERIALS
CAREYSTONE CORRUGATED SIDING
ASFALTSLATE SHINGLES
BUILDING PAPERS

A NEW WHEELED-TYPE LOADER

The Conveying Weigher Co., 90 West St., New York City, will be glad to send to those interested, a complete description of the Conweigh Rollround loader, a wheeled-type belt-conveyor unit having adjustment features for conveyor and wheels, an automatic safety-lock on the conveyor boom, wheels with a swivel adjustment to allow a pivotal, lateral or longitudinal movement of the loader and sizes ranging from 18 to 30 feet lengths with belts 16 to 24 inches wide, for 40 to 150 cubic yards per hour capacity.

A POWERFUL AND SPEEDY DRILL

Literature describing the Hardsocg Wonder drill as well as the complete line of rock drills, paving breakers, clay spades, drill steel, air hose and pneumatic sharpening and shaking machines, may be secured from the Hardsocg Wonder Drill Co., Ottumwa, Iowa.

A NEW SERIES OF SIX-CYLINDER HEAVY-DUTY ENGINES

In line with modern developments, an additional line of heavy-duty six-cylinder engines of the L-head type, is now offered by the Hercules Motors Corp., Canton, Ohio. This series, known at the HX series, has a downdraft manifold, double scavanging oil pump, a large capacity water pump, and many exceptional features which are described in literature which may be secured from the manufacturer on request.

CONCRETE PRODUCTS MACHINERY

Catalog No. 11, describing the full line of National concrete products machinery including power tampers, feeders, hoppers and bins, mixers, mixer elevating stands, skip loaders, conveyors and elevators, crushers and screens and similar equipment, may be secured by those interested from the Cement Block Machinery Co., 17 Durand St., Newark, N. J.

A COMPLETE LINE OF ROTARY FRESNOS

The Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill., will be glad to send to those interested a copy of the new Bulletin W 31-A, describing the complete line of Western rotary fresnos which are made in four sizes and for all tractors, the smaller sizes being practical finishing tools for use behind tractors of 15, 20 and 30 horsepower and the 7-foot No. 60, a large cut-and-carry tool, built to utilize the full power of a 60 or 75-horsepower tractor.

A NEW ONE-YARD TRANSIT MIXER

Literature describing the Lee-Mix new 1-yard transit mixer which may be mounted on any light truck chassis and which makes possible economy in concrete costs by the use of central-mixed concrete, may be secured by those interested from the Lee Transit Mixer Co., 129 East Market St., Indianapolis, Ind.

A NEW 12-CUBIC YARD DRAG-SCRAPER

A complete description of the 12-cubic yard Crescent drag-scraper which brings in a load of 16 to 17 tons of earth at a time and weighs only 5½ tons, may be secured on request from Sauerman Bros., 438 South Clinton St., Chicago, Ill.

A SELF-LOADING AND UNLOADING MATERIAL CARRIER

The Willamette Utility carrier, a self-loading and self-unloading straddle-type truck for carrying pipe, steel, brick and similar materials, which has a speed of 45 miles an hour, 4-wheel hydraulic brakes and full automotive equipment, is described in literature which the Willamette-Ersted Co., East 29th & Clackamas Sts., Portland, Ore., will be glad to send on request.

EQUIPMENT FOR CONTRACTORS

This is the title of a new booklet describing the complete line of Chicago-Pneumatic compressors and tools for contractors which may be secured by those interested from the Chicago Pneumatic Tool Co., 6 East 44th St., New York City.

PUMPS, COMPRESSORS AND GOVERNORS

A complete set of bulletins describing the line of Gardner-Denver pumps, compressors of various types and governors has been put out in a loose leaf binder and may be secured upon request from the Gardner-Denver Co., Quincy, Ill.

BUILDING GAS LINES BY WELDING

The A. O. Smith Corp., Milwaukee, Wis., has just issued in its Bulletin No. 510, a particularly valuable treatise on a new way of designing and building gas lines with Smith welded pipe. This booklet will be found of particular interest by contractors engaged in pipe line work.

CALCIUM CHLORIDE FOR CURING CONCRETE

The latest reports and data on calcium chloride concrete curing practice, describing the use of calcium chloride in a concrete mix to attain high early strength and permit an earlier release of forms, may be secured from the Dow Chemical Co., Midland, Mich.

SHOULDER AND BERM MACHINE

Moritz-Bennett Corp., Effingham, Ill., will be glad to send to those interested, a complete description of the Moritz shoulder and berm finishing machine for highway work.

LANTERNS AND HIGHWAY TORCHES FOR CONTRACTORS

Literature describing the Dietz line of Hy-Lo lanterns and torches which offer dependable low cost protection of contracting interests and public safety, may be secured by interested contractors from R. E. Dietz Co., 60 Laight St., New York.

A STURY PORTABLE BELT CONVEYOR

A sturdily constructed, amply powered and easily moved portable belt conveyor for handling sand, gravel and crushed stone, is described in Bulletin 35-1 of the Fairfield Engineering Co., Marion, Ohio. This well-balanced conveyor has a maximum overhang, easy discharge height adjustment, wide rubber belt, troughed-type carrying idlers and large roller bearing wheels and swiveling spindles.

BAR SUPPORTS AND SPACERS FOR CONCRETE WORK

Road Building Accessories Catalog No. 229 issued by the Union Steel Products Co., Albion, Mich., completely describes the Union line of bar supports and bases and other bridge accessories for supporting reinforcing steel in bridge and other reinforced concrete structures.

NEW EIGHT AND TEN-TON INDUSTRIAL LOCOMOTIVES

Complete information regarding the new 8 and 10-ton Brookville industrial locomotives for McCormick-Deering power which have five forward and five reverse speeds ranging from 2 to 16 miles per hour, may be secured from the Brookville Locomotive Co., Brookville, Pa.

CAST IRON HIGHWAY CULVERTS

The U. S. Pipe & Foundry Co., Burlington, N. J., has issued a very helpful book on the use of cast iron pipe for highway culverts. This book, which may be secured free by contractors, gives a great deal of technical information on the strength of cast iron culverts, data on determining the most efficient diameter for culverts, the installation of multiple culverts, skew culverts, the use of lock joint highway culverts and a number of photographs of installations.

A NEW FAST MIXING 14-S MACHINE

Bulletin No. 127 just published by the Ransome Concrete Machinery Co., Dunellen, N. J., announces the new Ransome 14-S mixer which, as in the larger Ransome mixers, has the blades so arranged as to produce a thorough, quick mixing action.

A TRUCK MIXER WITH DELIVERY CHUTE

A new truck transit mixer, consisting of a 4 to 5-ton Federal chassis made by the Federal Motor Truck Co., Detroit, Mich., equipped with a Jaeger truck transit mixer made by the Jaeger Machine Co., Columbus, Ohio, has been put on the market. Complete information regarding the unit may be secured from the Jaeger Machine Co.

COMPRESSED AIR FOR SEMI-PERMANENT INSTALLATIONS

Bulletin No. 102 of the Pennsylvania Pump & Compressor Co., Easton, Pa., describes Pennsylvania compressors with a dual compressor control which makes them economical for use on semi-permanent installations such as quarries and large building construction.

A HALF-YARD SHOVEL WITH NO TAIL SWING

A crawler shovel operated by a 35-horsepower tractor engine and which is full-circle loading and three-quarter digging, has been placed on the market by the Michigan Power Shovel Co., Benton Harbor, Mich., and is described in the literature of this company.

PLACING CONCRETE PLASTER BY MACHINE

The new Pneucrete gun made by the Pneucrete Corp., Ltd., Long Beach, Calif., to apply a premix of coarse sand and cement in a dry state through a nozzle in which water is mixed with the aggregates and cement for furnishing a permanent fireproof and weatherproof coating through walls and structures, is described completely in literature of the manufacturer which may be secured by any contractor free on request.

PORTABLE ROAD-TYPE ASPHALT PLANT

Hetherington & Berner, Indianapolis, Ind., will be pleased to send literature describing its three sizes of portable road-type asphalt plants capable of producing 120, 150 and 235 square yards per hour of asphaltic concrete surface, 2 inches thick.

AN OIL RESERVOIR SHEAVE

The Ebel oil reservoir sheave which holds two quarts of lubricant and has a manganese groove which is replaceable is described and illustrated in a folder which may be secured from the Ebel Hoist and Pump Co., 324-26 South Hosmer St., Lansing, Mich.

A POWERED PORTABLE HOIST

Wyman's powered portable hoist capable of lifting 500 pounds on a single line at a speed of 75 feet per minute, being particularly adaptable for builders, water works and other municipal departments, material handlers and contractors is described in a folder which may be secured from the Interstate Equipment Corp., 331-333 South St., Newark, N. J.

TILTING TRUCK BODY FOR SPEED LOADING

The Griswold Powermatic Corp., Detroit, Mich., will be pleased to send complete information regarding the Powermatic unit which increases truck efficiency by reducing loading and unloading time through moving the body of the truck backwards and downwards to the ground thus providing its own ramp for loading heavy machinery and equipment.

A NEW ROCK CRUSHER WITH BUT ONE MOVING PART

Complete information concerning a new rock crusher designed for reduction or secondary work which is quiet running, has but one moving part, is practically free from vibration and is known as the Ohio crusher, may be secured from the James H. Beans Foundry Co., Martins Ferry, Ohio.

A PORTABLE FORCED FEED JAW CRUSHER

The Day Pulverizer Co., Knoxville, Tenn., will be glad to send to those interested complete information in regard to the Day portable all-steel forced feed jaw crusher, which is drawn and powered by a Caterpillar tractor, handles the hardest field stone and ledge rock, may be detached in 2 minutes and leaves the tractor free for other work.

HEAVY-DUTY TRAILERS

Catalog No. 28, describing Rogers heavy-duty trailers which are available in sizes ranging from 5 tons with four wheels to 100 tons with twelve wheels, conforming to all requirements, may be secured by those interested from Rogers Brothers Corp., 108 Orchard St., Albion, Penna.

TRACTOR DUMP WAGONS

Complete information is regard to Ohio tractor dump wagons, with capacities of 3 to 4 yards, and equipped with crawlers, wheels or rubber tires, which are interchangeable in the field, may be secured by interested contractors from the Ohio Locomotive Crane Co., Bucyrus, Ohio.

A NEW PORTABLE CRUSHING PLANT

Diamond Iron Works, Inc., Minneapolis, Minn., will be glad to send on request a complete description of the new Diamond portable crushing plant which consists of a 15 x 36-inch Diamond Timken bearing equipped jaw crusher mounted on a heavy steel chassis fitted with roller bearing wheels and has a capacity of 600 tons of rock in 10 hours.

MODERN SEWAGE AND WATER TREATMENT PLANTS

This is the title of a booklet describing a number of sewage and water treatment plants in which Dorr equipment has been used and may be secured by those interested from the Dorr Co., Engineers, 247 Park Ave., New York City.

TARPAULINS AND TENTS

Samples and prices of Fulton Quality tarpaulins and tents which can be depended upon in all kinds of weather to give complete protection to equipment, supplies or workmen will be sent on request by the Fulton Bag & Cotton Mills, Atlanta, Ga.